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ABSTRACT

Guidelines, based on an analysis of currently successful work measurement systems found in 10 different Federal agencies, are presented for the development of standards and the use of these data for work measurement. The guidelines were developed in response to significant problems many Federal agency headquarters and staff managers were experiencing with their work measurement systems, and in response to their lack of knowledge and interest in work measurement. The guidelines are, therefore, written in a conversational mode, as a dialog between the author and an imaginary naive and skeptical manager. General in nature, the guidelines require analysis and interpretation before they can be applied. An introductory chapter on the role of work measurement in performance measurement is followed by an explication of the need for quality work measurement standards in the planning and control of budget, manpower, and workload. The steps to be taken in establishing a work measurement system are then laid out, from preliminary considerations to staffing and training, and cost and disincentives are discussed. Maintaining performance is the topic of the final chapter. The book is heavily illustrated with graphs and tables; the appendixes include a breakdown of work measurement techniques. (AJ)

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# WORK MEASUREMENT GUIDELINES for FEDERAL GOVERNMENT MANAGERS

Prepared for the
Joint OMB/GAO/CSC
Productivity Steering
Committee

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UNITED STATES ARMY [illegible] AGENCY
June [illegible]

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# WORK MEASUREMENT GUIDELINES
# FOR FEDERAL GOVERNMENT MANAGERS

Guidelines for executives, field directors and managers on the application of work measurement for improved budget, manpower, and workload planning and control

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JUNE 1973

# FOREWORD

It was determined during a study on "Measuring and Enhancing Productivity in the Federal Sector"* that many Federal Agency headquarters and staff managers have significant problems with their work measurement systems, both in the development of standards and in the use of this data. Also, significant numbers of these managers lack knowledge and interest in work measurement. These guidelines are specifically designed to deal with these problems.

It was not considered practical to develop explicit guidelines on the implementation and utilization of work measurement that would be universally applicable throughout the Federal Service. Consequently, the guidelines are general in nature and will require careful analysis and interpretation when deciding when, where and how to apply them.

The information provided is based on the analysis of currently successful work measurement systems found in ten different Federal agencies.** The guidelines are based on the practices which have proven to be useful in these systems over a period of several years.

The guidelines are written in a conversational mode to facilitate ease of reading and understanding. They may be read like a book or used as a reference document. The term "organization" as used throughout the guidelines refers to military and civilian government organizational elements.

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* Joint Committee Print, 92nd Congress, 2nd Session dtd August 4, 1972, is available from the US Government Printing Office, Washington, DC 20402 - Price 60 cents.

** "Improving Work Measurement Systems in the Federal Government", prepared by the US Army Management Engineering Training Agency for the Joint Project for Measuring and Enhancing Productivity, June 1973.

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# CHAPTER I

## THE ROLE OF WORK MEASUREMENT IN PERFORMANCE MEASUREMENT

### ① What is the purpose of these guidelines?

As an executive or field director, you are faced with many problem-solving and decision-making situations. These generally involve the expenditure of money and utilization of manpower to accomplish work in performing specified missions. The purpose of this handbook is to show the contribution work measurement can make to the improvement of resource utilization (performance efficiency) and, therefore to mission effectiveness.

Specifically, it has been designed to assist you:

- Define and clarify the relationship between work measurement and other systems of performance measurement.
- Determine the need for new or improved systems of work measurement.
- Establish new or improve existing systems of work measurement.
- Maintain the performance of operating work measurement systems on a continuing basis.

## A. CATEGORIES OF PERFORMANCE MEASUREMENT

(2.) You use the terms, efficiency and effectiveness, as though they were different. I thought they meant the same thing.

There is considerable variation in the meaning of these terms as currently used throughout the Federal government. However, for our purposes, these terms are defined as follows:

- Effectiveness measurement compares actual results against some end objective or goal. These goals are a means of assessing how well an organization is accomplishing its mission programs.
- Efficiency measurement compares actual performance against some standard of performance to determine how well an organization is utilizing its available resources. It is an "economic" measurement.

(3.) Can you cite some examples of each?

Let's consider effectiveness measurement first. As we implied in our definition above, this kind of measurement deals with how good a job we are doing in achieving the basic mission of an organization. One or more items (mission elements) which best reflect mission accomplishment are selected for measurement. A goal or objective to be obtained is established for each item. Management assesses actual performance against these goals on a periodic basis to determine effectiveness. Each of the following items represents performance that contributes to the effectiveness of an organization.

| Item | Goal |
|---|---|
| Report process time | 9 days (elapsed time) |
| Investigations completed | 380 per manyear |
| Active backorders | 800 maximum any one time |
| Delinquent actions | 5% maximum/week |
| Invoices with errors | 3% maximum |

Do you have any questions on this?

[✓ 4.] No, I'm already using similar types of measurement in my organization.

I'm sure you are. Now let's consider efficiency measurements. This is a little more difficult to explain because there are three categories of efficiency measurement currently in use. These are productivity, unit cost, and work measurement as illustrated in Figure 1.

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**RELATIONSHIPS BETWEEN PERFORMANCE MEASUREMENTS**

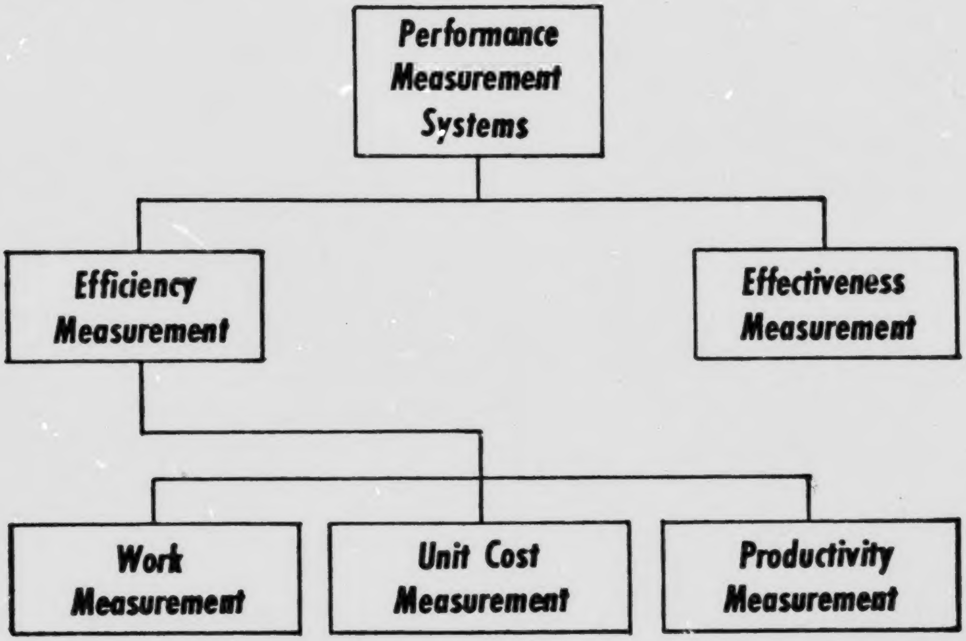
Performance Measurement Systems
Efficiency Measurement
Effectiveness Measurement
Work Measurement
Unit Cost Measurement
Productivity Measurement

Figure 1

Work Measurement converts a quantitative statement of workload to a quantitative statement of the manpower to produce that workload. This statement is called a work measurement standard or simply, a standard. Standards are actually ratios that relate output (goods or service) to resource input (manpower) for a task or job. It is frequently stated in units of work expected to be produced in a unit of time.

| Task | Work Unit | Work Measurement Standard |
|---|---|---|
| Conduct land surveys | Areas surveyed | 14 acres/hour |
| Repair generators | Repaired generator | 1 generator/hour |
| Audit tax returns | Tax return audited | 2 returns/hour |
| Process supply requisitions | Supply requisitions processed | 21 requisitions/day |

It is more commonly expressed in a reciprocal form, time per unit of work.

| Task | Work Unit | Work Measurement Standard |
|---|---|---|
| Conduct land surveys | Areas surveyed | 0.072 hours/acre |
| Repair generators | Repaired generator | 1.000 hours/generator |
| Audit tax returns | Tax return audited | 0.500 hours/return |
| Process supply requisitions | Supply requisitions processed | 0.047 days/requisition |

Performance efficiency (the efficiency measurement for work measurement) is determined by comparing standard (earned) manhours to actual hours. This comparison is expressed as a percentage, with 100% representing the expected performance. To illustrate, a work center auditing tax returns computes their performance efficiency for a one week period as follows:

| | |
|---|---|
| Task: | Audit tax returns |
| Output Measure or Work Unit: | Tax returns audited |
| Standard: | .500 hours/tax return audited |
| Number returns audited: | 800 |
| Actual manhours expended: | 475 |

$$\text{Performance efficiency} = \frac{\text{Work Units Completed (Standard)}}{\text{Actual Hours}}$$

$$= \frac{\text{Earned Hours}}{\text{Actual Hours}}$$

$$= \frac{800\ (.500)}{475} = \frac{400}{475}$$

$$= .84 \text{ or } 84\%$$

5. We already do this kind of computation at some of our field operations. It never seemed of much help to me however.

Probably not. Work measurement based performance measurement is generally considered to be most useful at lower operating levels. Unit cost and productivity measurement probably offer the greatest potential of direct value to you.

Unit Cost Measurement relates a work unit to the costs or resources consumed in producing that unit. Unit costs may include, in addition to personnel costs, the cost of supplies, travel, equipment, etc. Thus, unit costs reflect the ratio of personnel, materials, travel and other costs to the output produced, and will be stated in terms of dollars required to produce a unit of work.

| Work Unit | Planned Unit Cost |
|---|---|
| Acres surveyed | $ 0.38/acre |
| Repaired generator | 14.50/generator |
| Tax return audited | 9.10/return |
| Supply requisition processed | 3.38/requisition |

Performance efficiency (the efficiency measurement) is determined by comparing planned unit cost to actual unit costs. Thus, if the actual cost per acre surveyed for a specified time period was only $.33, management would conclude that performance was 115%, that is 15% above average.

The planned unit cost can be developed in several different ways. An average cost figure from the most recent reporting period may be selected, perhaps arbitrarily modified in an effort to "force" productivity increases. Another way, is to review cost data from several previous reporting periods and compute an average or establish a trend line that can be used to project future unit costs. A third way, and the best, is to establish work measurement standards, for the labor portion of the unit costs. These standards, representing the "should take" time, can then be compared against the "did take" past experience time to arrive at a planned unit cost.

Productivity Measurement relates gross measures of output for an organization to one or more associated inputs. The output measures are based on the volume of products or services produced for use outside the organization. Input measures may include labor, material, facilities, and equipment. However, most government organizations limit their input measurement to labor. They have yet to develop the capability to accurately identify or allocate these other costs against the unit of output.

A few productivity measurements in government organizations are:

| Program Activity | Output Measure | Input Measure |
|---|---|---|
| Soil Survey Activities | Soil Survey Reports | Man-years |
| Material Management Operations | Supply Actions Initiated | Man-years |
| Audits | Audits Completed | Man-years |
| Processing Check Claims | Claims Processed | Man-years |
| Trial Examiner Decision | Decisions Made | Man-years |
| Service to Commercial Carriers | Units Serviced | Man-years |

## (6.) Let's see an example of application.

To illustrate, an organization provides a service to commercial carriers. A productivity measurement system is used by top management to assess overall organizational performance.

| Fiscal Year (1) | Number of Units Serviced (2) | Number of Employees (3) | Productivity Measurement Ratio (4) | Productivity Index (5) |
|---|---|---|---|---|
| 1970 | 34 million | 3908 | 8700 | 1.00 |
| 1971 | 37.1 million | 4134 | 8974 | 1.03 |
| 1972 | 42.2 million | 4186 | 10081 | 1.16 |

The values for Columns 4 and 5 are computed as follows:

(a) The productivity measurement ratio for the base year (1970) is established using the following formula.

$$\text{Productivity measurement ratio (PR)} = \frac{\text{output}}{\text{input}} = \frac{\text{Col 2}}{\text{Col 3}} = \frac{34,000,000}{3908}$$

$$= 8700 \text{ units serviced/employee}$$

(b) The productivity index for the base year (1970) is computed

$$\text{Productivity index (PI)} = \frac{\text{PR (any year)}}{\text{PR (base year)}} = \frac{8700}{8700} = 1.00$$

(c) The productivity measurement and productivity index for the year 1971 is computed

$$PR = \frac{37,100,000}{4134} = 8974$$

$$PI = \frac{8974}{8700} = 1.03$$

(d) The measurements for 1972 are computed in a similar fashion.

Productivity indices are a "score card" for an organization. They can be used to forecast trends in output, and where the trend is unfavorable, actions can be taken to influence them in the desired direction. Like a school report card, they are a long term type of measurement. This is in contrast to unit cost and work measurement which are short term measurements like tests and class recitations.

(7.) I'm not sure I can keep all this performance measurement business straight!

It's not exactly easy. Table I may help you on this. It summarizes some of the things we have been talking about.

## B. ROLE OF WORK MEASUREMENT

(8.) O. K., but can you summarize in what way work measurement is related to unit cost and productivity measurements?

First let's consider work measurement and unit cost. Work measurement, the lowest level of measurement, deals only with manhours per unit of output. Unit cost measurement deals with all costs required to produce a unit of output and, therefore, is not limited to manpower costs. However, unit cost builds on work measurement to supply the information on manpower costs.

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## TABLE 1

## ELEMENTS OF PERFORMANCE MEASUREMENTS

| Element | Work Measurement | Unit Cost Measurement | Productivity Measurement | Effectiveness Measurement |
|---|---|---|---|---|
| Baseline Measure | Standard Time | Standard Unit Cost | Base Year Output/Input Ratio | Mission Goal |
| Reporting Period Measure | Actual Time | Actual Unit Cost | Actual Output/ Input Ratio | Actual Accomplishment |
| Performance Measurement Calculation | Standard Time Divided By Actual Time | Standard Time* Divided By Actual Time | Actual Ratio Divided By Base Year Ratio | Actual Accomp.* Divided By Mission Goal |
| Performance Measurement Common Descriptor | Performance Efficiency | Performance Efficiency | Productivity Index | Performance Effectiveness |
| Principal Use | Short Term Control | Short Term Control | Long Term Control | Short and Long Term Control |

* Sometimes a comparison is made between the actual and the baseline in lieu of a calculation.

They are similar in that both measurements are:

- Used as a standard or "benchmark" to compare against actuals.
- The standards are changed to reflect authorized changes in methods and procedures.
- Used by management primarily for short range management tools.

9. That was the easy one. Now, what about work measurement and productivity measurement. I'll bet this one's tougher!

Not really. Remember, work measurement and productivity measurement both establish output and input ratios for a unit of output. However, the differences are greater than the similarities.

The output measure for productivity measurement is usually very gross and deals exclusively with products or services produced for use outside the organization. The input may include the dollar cost for labor, materials, facilities, and equipment. In actual practice, it is usually limited to labor inputs, expressed in man-years or manhours.

The output measure for work measurement is normally more detailed and often deals with products or services that will receive further processing within the organization. The input is always limited to manhours; however, as will be discussed later, program level work measurement standards and productivity measurements may, in some cases, be integrated.

Productivity measurement is used by top management to track and monitor performance of entire organizations on a long term (e.g., yearly) basis. However, manpower is usually by far, the most important resource in government programs. Work measurement can be used to establish standard output/input ratios. These standards can then be used to "sharpen up" the management decision making involved in budgeting, manpower, and workload planning and control. Quality work measurement standards can contribute to accurate productivity measurements.

⑩ From what you tell me, work measurement seems to permeate all the efficiency measurements. What about effectiveness measurements?

In most instances, the relationship is only indirect. To the extent that work measurement contributes to more efficient operations, it may lead to improved organizational effectiveness.

⑪ In other words, forget it!

No, I wouldn't do that. Remember, I said "in most instances." Where a very summarized work unit or gross organizational output measure is used for effectiveness measurement, it is possible to have a direct relationship between all the performance measures we have talked about. Let me give you an illustration. At the present time one organization has several of its effectiveness measures integrated with efficiency measures at a summary level. An example of these measures are:

- o Effectiveness measurement -- one goal used is "elapsed processing time per case".
- o Productivity measurement -- productivity index for "cases completed per manyears" is calculated and tracked.
- o Work measurement -- a historical standard is developed at the summary level for "manhours per case closed."

The element of these measurements that permits integration is the common unit of output (i.e., cases closed). Where this commonality of units of work exists, trade-offs between efficiency and effectiveness can be realistically evaluated. The key to achieving these common units of work is the hierarchy of work units which I want to discuss with you later.

The performance measurements used at lower management levels can be integrated in a similar fashion when a common work unit is used for all performance measurements.

# CHAPTER II

## THE NEED FOR QUALITY WORK MEASUREMENT STANDARDS

1. So far, you've only talked about work measurement and the other performance measurements on a rather conceptual basis. Just why do I need work measurement for my organization?

There are three major areas where work measurement standards can be useful in your organization. Quality work measurement standards are needed as a vital input to management decision making for budget, manpower and workload planning and control.

2. You've used another new term "quality work measurement standards." Just what do you mean?

Standards with time values representative of those needed to accomplish each task (accurate or reliable) and based on the method or procedure that will be used (validity). They should be developed and formally approved by management. I'll discuss this in greater detail later (Chapter III H).

3. Why is the quality of a work measurement standard important?

I'm glad you asked. Work measurement involves the measurement of time in a manner similar to the measurement of distances. For example, a wide variety of procedures and techniques are used to measure distances. These include making visual estimates, pacing off a distance, and using measuring tapes, yardsticks, rulers, and surveyors chains. In general, as the precision of measurement increases, so does the cost. Measurement procedures and techniques are selected to meet the minimum level of measurement precision needed.

The measurement of time in work measurement is similar to distance measurement. A variety of measurement procedures and techniques can be used. The precision and cost of these measurements also vary in an inverse relationship. The measurement method selected should meet the minimal level of precision or "quality" needed.

④ In other words, the quality sought for a work measurement standard should be matched against its application?

Right! But let's get back to the need for standards in the budget, manpower and workload planning and control.

The various activities or phases occurring in the accomplishment of each of these functions are illustrated in Figure 2. The organizational level(s) involved in each of these activities is shown at the bottom of the illustration. The overall planning phase is divided into gross and detail planning, with the detail planning defined as that which is done at the operation or field organization to accomplish a specific job. The need for a quality work measurement standard for each of these functions will be discussed using the figure as a framework.

⑤ Are you going to discuss budgeting first? Most things in my organization are ultimately driven by the budget.

That is probably the best place to start for that very reason. Most managers that I have talked with before have expressed the same thought about budgets.

## A. BUDGET PLANNING AND CONTROL

### 1. INITIAL BUDGET FORMULATION

⑥ What do you consider as part of initial budget formulation?

Figure 3 illustrates the myriad of activities typically involved in developing an organization's budget submission. As you undoubtedly know, the initial budget formulation phase is an iterative process and may require several cycles prior to formal submission of the budget to OMB and Congress.

Many organizations believe that the use of accurate, detailed standards at lower organization levels to formulate preliminary budgets and their summing all these lower level budgets to determine the total agency budget is a "waste of time", since the amount of resource (both funds and manpower) requested are often substantially greater than those appropriated.

# APPLYING WORK MEASUREMENT STANDARDS to PLAN and CONTROL:

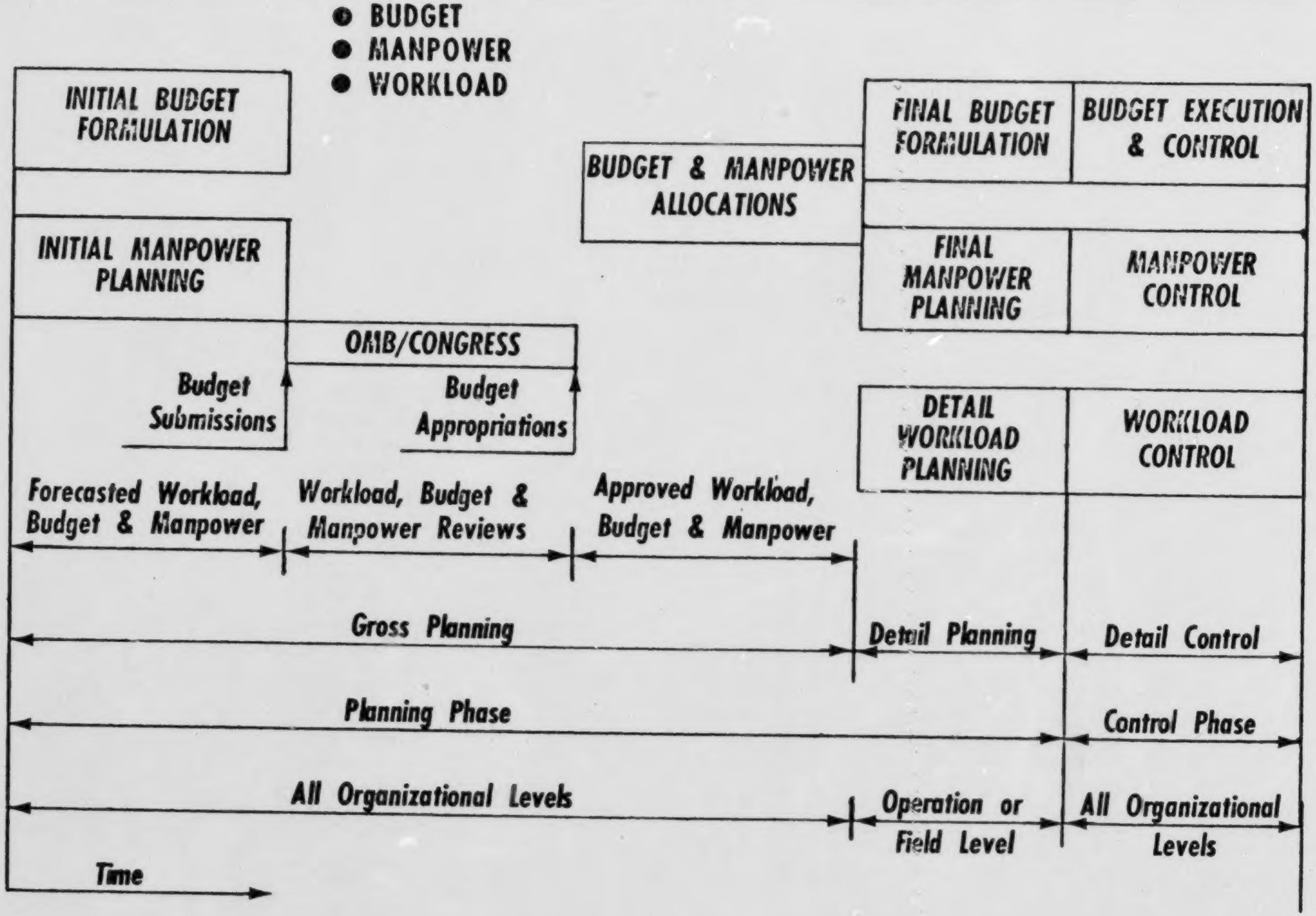
● BUDGET
● MANPOWER
● WORKLOAD
INITIAL BUDGET FORMULATION
INITIAL MANPOWER PLANNING
OMB/CONGRESS
Budget Submissions
Budget Appropriations
BUDGET & MANPOWER ALLOCATIONS
FINAL BUDGET FORMULATION
BUDGET EXECUTION & CONTROL
FINAL MANPOWER PLANNING
MANPOWER CONTROL
DETAIL WORKLOAD PLANNING
WORKLOAD CONTROL
Forecasted Workload, Budget & Manpower
Workload, Budget & Manpower Reviews
Approved Workload, Budget & Manpower
Gross Planning
Detail Planning
Detail Control
Planning Phase
Control Phase
All Organizational Levels
Operation or Field Level
All Organizational Levels
Time

Figure 2

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INITIAL BUDGET FORMULATION PHASE

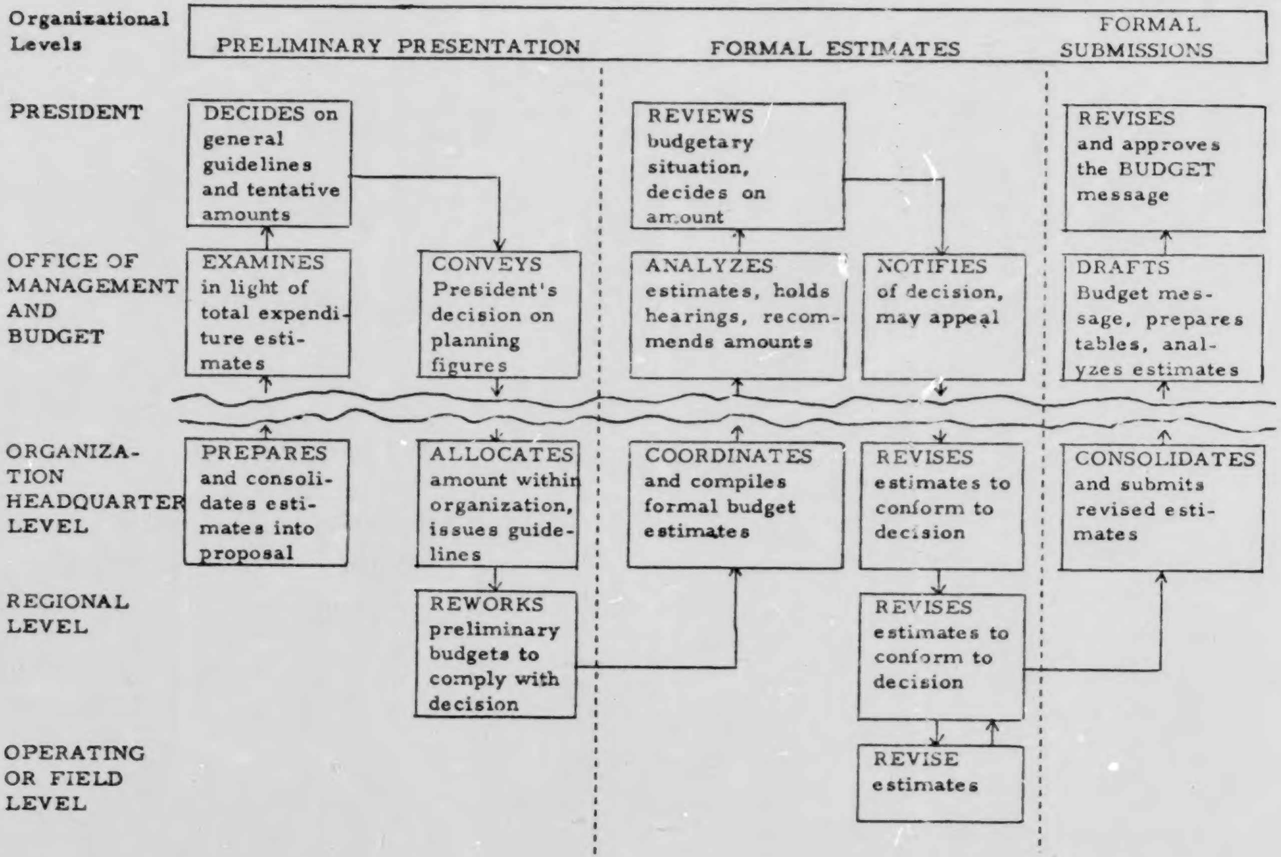
Organizational Levels
PRELIMINARY PRESENTATION
FORMAL ESTIMATES
FORMAL SUBMISSIONS
PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
ORGANIZATION HEADQUARTER LEVEL
REGIONAL LEVEL
OPERATING OR FIELD LEVEL
DECIDES on general guidelines and tentative amounts
EXAMINES in light of total expenditure estimates
PREPARES and consolidates estimates into proposal
CONVEYS President's decision on planning figures
ALLOCATES amount within organization, issues guidelines
REWORKS preliminary budgets to comply with decision
REVIEWS budgetary situation, decides on amount
ANALYZES estimates, holds hearings, recommends amounts
COORDINATES and compiles formal budget estimates
NOTIFIES of decision, may appeal
REVISES estimates to conform to decision
REVISES estimates to conform to decision
REVISE estimates
REVISES and approves the BUDGET message
DRAFTS Budget message, prepares tables, analyzes estimates
CONSOLIDATES and submits revised estimates

Figure 3

⑦ I agree with them!

That is why many initial budgets are formulated by using judgment to modify last year's budget to accommodate anticipated changes in workload.

After the initial budget formulation is completed, these budgets are submitted to Congress and OMB in the form of an operation (object class) budget. A typical example of an operating budget submission for a program is shown in Figure 4

⑧ That's exactly the way it works in my organization. But, somehow, I get the feeling you're setting me up. Is anything wrong with that approach?

Operating (object class) budgets have the inherent weakness that they do not relate the resources required to the workload planned to be accomplished. In most cases, operating budgets, as submitted to higher authority, lack backup data and documentation relating workload to resources to adequately support the budget.

⑨ That's what our OMB budget examiner is claiming!

A few organizations do provide backup data and documentation to support the operating budget. Typically, this supportive data consists of justification of manpower and budget requirements using high (program or project) level work measurement standards and staffing ratios together with workload forecasts at the same level. Figure 5 is an example of the type of data utilized to support an operating budget. When operating budgets and support data of this type are submitted to higher authority, it provides the following benefits:

- Agency level budgets and support documentation are relatively easy to develop and review.
- Orderly evaluation of budget submissions is permitted because costs are related to workload.
- Reviewers can determine workload priorities and assess trade-offs.

# EXAMPLE OPERATING (OBJECT CLASS) BUDGET

## FOR PROGRAM Y

| | OBJECT CLASSIFICATION (in thousands of dollars) | | |
|---|---|---|---|
| | Identification code 06-05-0120-0-1-XXX | 1972 actual | 1973 est. |
| | Direct obligations: | | |
| | Personnel compensation: | | |
| 11.1 | Permanent positions | 5,820 | 6,454 |
| 11.3 | Positions other than permanent | 75 | 90 |
| 11.5 | Other personnel compensation | 36 | 24 |
| | Total personnel compensation | 5,931 | 6,568 * |
| 12.1 | Personnel benefits: Civilian | 459 | 512 * |
| 21.0 | Travel and transportation of persons | 85 | 128 |
| 22.0 | Transportation of things | ----- | 5 |
| 23.0 | Rent, communications, and utilities | 164 | 227 |
| 24.0 | Printing and reproduction | 97 | 54 |
| 25.0 | Other services | 666 | 820 |
| 26.0 | Supplies and materials | 52 | 30 |
| 31.0 | Equipment | 30 | 18 |
| | Total direct obligations | 7,484 | 8,362 |
| | Reimbursable obligations: | | |
| | Personnel compensation: | | |
| 11.1 | Permanent positions | 237 | 216 |
| 11.3 | Positions other than permanent | 138 | 240 |
| 11.5 | Other personnel compensation | 1 | ----- |
| | Total personnel compensation | 376 | 456 * |
| 12.1 | Personnel benefits: Civilian | 29 | 32 * |
| 21.0 | Travel and transportation of persons | 4 | 5 |
| 23.0 | Rent, communications, and utilities | 16 | 28 |
| 24.0 | Printing and reproduction | 25 | 194 |
| 25.0 | Other services | 113 | 142 |
| 26.0 | Supplies and materials | 4 | 5 |
| | Total reimbursable obligations | 567 | 862 |
| 99.0 | Total obligations | 8,051 | 9,224 |

* The sum of these numbers equals the total labor dollars shown on Figure 5.

Figure 4

BUDGET SUPPORT DATA
FOR PROGRAM Y
FOR FY73

| Project | Work Unit | Forecasted Workload | Standard (Units/hour) | Manhours | Labor Dollars |
|---|---|---|---|---|---|
| Project Y1 | Unit Y1 | 30, 100 | 10 | 301, 000 | 3, 010, 000 |
| Project Y2 | Unit Y2 | 57, 900 | 5 | 289, 500 | 2, 236, 000 |
| Project Y3 | Unit Y3 | 8, 170 | 20 | 163, 400 | 1, 634, 000 |
| Non-Direct Labor | | 11. 5% of Direct Labor Dollars | | 86, 000 | 688, 000 |
| TOTAL | | | | 839, 900 | 7, 568, 000 |

Figure 5

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⑩ You must have been talking to our budget examiner!

Please note that the budget support data (Figure 5 ) shows what work will be produced if the budget dollars (Figure 4 ) are provided. The total labor dollars shown in Figure 5 is the sum of the four asterisked figures in Figure 4.

⑪ O.K.; but what would be the organization's payoff for providing this additional data?

Let me give an example of how one civilian organization benefited. For several years, this organization had not been able to justify to higher authority the required manpower to accomplish its mission. About three years ago, this organization developed a work measurement system based upon high quality standards at the operating level. The work measurement system was designed with the capability of aggregating work units and standards. With this system capability, the organization is now able to formulate budgets which are well documented and supported with quality high level standards. Accordingly, this organization in recent years (even under current austere economic conditions) has been able to obtain the necessary budget and manpower resources required to accomplish their expanding workload.

⑫ What would you suggest that I do to improve my budget formulation process?

First, quality high level work measurement standards and formally developed staffing ratios suitable for use at your level should be developed and used in the formulation of your budget submissions, as well as at any higher level formulation for the final submission to OMB and Congress.

Secondly, budget submissions should utilize a consistent format from year to year that allows meaningful comparison between workload and the resources required.

Remember, higher authority is more likely to provide requested resources if budget submissions contain adequate justification. Additionally, you will derive several benefits within your own organization. You will have improved ability to:

- Track productivity trends over a period of time.

- Establish a valid baseline against which actual performance may be assessed.

- Determine the resources required to accomplish a specified workload.

- Evaluate proposed budget changes.

## 2. BUDGET ALLOCATIONS

### 13. What about the budget allocation phase?

After budget submissions are reviewed by OMB and Congress, and funds are appropriated, the process of allocating (or distributing) the appropriated funds begins. The allocation of available funds starts at the organization headquarters level. Funds, together with approved mission workload, are distributed to the next lower organizational level. When available, program level standards and staffing ratios are used to determine the funding levels for the manpower needed to accomplish the approved workload. This process continues to successively lower organizational levels using standards and staffing ratios appropriate to each level until allocations have been made to the lowest organizational level. These funding allocations become the basis for developing a final operating budget at each organization level.

### 14. We use a procedure that closely parallels what you describe!

In general, organizations with quality work measurement standards experience significantly fewer internal problems associated with allocating resources throughout all levels of the organization on an equitable basis, than do organizations with less accurate work measurement standards. Also, those organizations which have developed historical standards and formally developed staffing ratios for non-direct labor areas, have found them very useful in the allocation of resources to these organizational areas.

For example, the civilian agency referred to in the previous example stated that after development of their standards, their capability to accurately allocate resources within the organization greatly improved. Also, barring any unforeseen major changes in the level of the workload, the need for replanning and reallocation of resources has been greatly reduced. Other organizations report similar benefits from the use of quality work measurement standards and staffing ratios in the resource allocation process.

(15.) We don't currently use many standards in this process. We rely heavily on past experience tempered with judgment and budget allocation has never been a problem.

You must be blessed with outstanding judgment or unusually good luck. Most organizations who allocate budgets that way find that one or both of the following situations develop.

- Many replanning exercises are necessary to offset problems caused by inequitable allocation.
- A large pot of money is held at the headquarters level initially and then doled out to those subordinate organizations needing additional resources throughout the year.

(16.) I didn't say we haven't had a minor problem or two. No organization runs that smoothly. I can't argue with the logic that to assure equitable allocation and control of resources, work measurement standards or staffing ratios should be utilized to the maximum extent possible. What about that next block on Figure 2 ; how does work measurement tie in here ?

## 3. FINAL BUDGET FORMULATION

The allocation of funds provides a "ceiling" or upper control limit for the formulation of the final budgets. At this point in time, the budget establishes the level at which each organization's mission will be accomplished. Upon receipt of the approved budget allocation, a final operating budget is developed at each organization level. In organizations that base the allocation of manpower budgets on work measurement standards, performance budgets are also often developed. Performance budgets relate approved workload to manpower and other resources required. Figure 6 illustrates the contents of a typical performance budget.

## ORGANIZATION A
## PERFORMANCE BUDGET FOR FY73

| Activity | Workload Unit | Forecasted Workload | Standard (Units/hour) | Labor Hours | Labor Costs | Other Costs | TOTAL |
|---|---|---|---|---|---|---|---|
| Program X | | | | | | | |
| Project X1 | Unit X1 | 20,000 | 20 | 400,000 | 3,600,000 | 200,000 | 3,800,000 |
| Project X2 | Unit X2 | 12,000 | 50 | 600,000 | 6,000,000 | 600,000 | 6,600,000 |
| Project X3 | Unit X3 | 6,000 | 100 | 600,000 | 6,000,000 | 396,000 | 6,396,000 |
| Project X4 | Unit X4 | 2,000 | 200 | 400,000 | 4,400,000 | 364,000 | 4,764,000 |
| Non-Direct Labor | | 12.5% of Direct Labor Hours | | 250,000 | 2,000,000 | 406,000 | 2,406,000 |
| TOTAL | | | | 2,250,000 | 22,000,000 | 1,966,000 | 23,966,000 |
| Program Y | | | | | | | |
| Project Y1 | Unit Y1 | 30,100 | 10 | 301,000 | 3,010,000 | 361,200 | 3,371,200 |
| Project Y2 | Unit Y2 | 57,900 | 5 | 289,500 | 2,236,000 | 856,050 | 3,092,050 |
| Project Y3 | Unit Y3 | 8,170 | 20 | 163,400 | 1,634,000 | 283,250 | 1,917,250 |
| Non-Direct Labor | | 11.5% of Direct Labor Dollars | | 86,000 | 688,000 | 155,500 | 843,500 |
| TOTAL | | | | 839,900 | 7,568,000 | 1,656,000 | 9,224,000 |
| Program Z | | | | | | | |
| TOTAL | | | | 3,762,000 | 33,601,000 | 4,041,000 | 37,642,000 |

Figure 6

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(17.) We've been considering implementing a cost-based budget system now for several years. It's never gotten very far beyond the talking stage. Our cost budgets would be similar in content to your performance budget.

Most organizations that apply performance type budgets build them from the bottom up. The operating or field level organizations develop a performance budget that is properly correlated with their approved operating budgets. These operating level performance type budgets are then aggregated to develop regional and headquarters level performance budgets, as appropriate. Work measurement standards and staffing ratios are used to build these budgets which then become the basis for budget control.

Development of performance type budgets based on quality work measures will:

- Force quantified justification of the resources needed to accomplish a specified amount of mission workload by each organizational level.
- Permit orderly evaluation of proposed budget changes.
- Provide valid baselines against which actual performance can be assessed, thus permitting improved control.
- Improved communications between headquarters and the field or operating level organizations.

## 4. BUDGET EXECUTION AND CONTROL

(18.) Just how would a performance budget do all these good things?

I'd like to answer this in considerable detail because of its importance. This is an area where the application of quality work measurement standards can be particularly useful to an executive, field director or manager.

⑲ All right. I know we should be doing better in this area than we are now.

After work is initiated in accordance with plans and schedules, performance data is collected, analyzed, and processed to develop various reports which are used by all levels of management to assist in controlling the execution of budget, manpower, and workload functions.

Of course, every budgeting organization uses management reports which describe the nature, type, and rate of expenditures. However, two fundamentally different operating philosophies are encountered in budget organizations. These are funds control and cost control.

⑳ What is the difference between these terms? To me, funds control and cost control mean essentially the same thing.

The majority of the budgeting organizations believe that their responsibility is limited to funds control. That is, they are responsible for the control of expenditures and not with the cost of workload accomplishments. In these organizations, the budget reports relate the expenditures to the operating or object class budget for each program or program element (e.g., project). These organizations make little use of work measurement standards to analyze budget performance. Surprisingly, in these same organizations, work measurement standards are often used in the Budget Allocation and Final Budget Formulation. This apparent contradiction is explained away by saying that standards are required to justify the budget, but are not really needed to control the expenditure of funds. Another reason given to explain the funds control only philosophy is that reports on workload accomplishments are often received much too late to permit a useful assessment of costs. Some budget organizations claimed that reports on workload outputs are not received until several months after it has been completed.

However, some budgeting organizations are fund and cost control oriented. In these organizations, both expenditures and the workload accomplishments are monitored and controlled to assure that the organization is "getting its money's worth." Management reports for these organizations usually include both operating and performance budget status summaries. Work measurement standards are actively used at all organizational levels to achieve tight cost control over operations.

(21.) I'm of the opinion that budget organizations should be primarily funds control oriented. Most of my budget types agree with me. After all, costs can only be controlled by the organizations actually doing the work.

Not everyone would agree with you. The advantages that accrue to a budgeting organization that is cost control oriented, rather than solely funds control oriented, can best be illustrated by providing several examples. We'll look at a funds control approach first.

### 5. FUNDS CONTROL REPORTING

Figure 7 illustrates a monthly funds status report for Program "X". In addition, the labor costs (object class 11.1, 11.2, 11.4), planned and actual, for the past three months have been plotted to show expenditure trends (Figure 8).

The Budget Status Report shows very nicely, the rate of expenditure (planned versus actual) for both the current reporting period and for the year to date. However, they may not indicate the "true budgetary status" of the program since they do not relate resources expended to the workload accomplished. For example, Figures 7 and 8 indicate that the total expenditures for labor for the year-to-date at the end of September are $5.4M actual and $5.5M planned. Also, the trend of actual expenditures is following very closely the trend of planned expenditures for manpower. Thus, on the basis of the Budget Status Report above, budgeting personnel could conclude that everything is going smoothly for Program "X". Later, a quarterly Workload Progress Report for Program "X" (see Figure 9), is provided to the Budgeting Office by the organization accomplishing the work. This reveals that the Program is not going as well as the Budget Status Report previously indicated.

It is now apparent that although 97% of the labor dollars planned ($5.4M of $5.5M) for 10,000 units has been expended, only 79% of the units planned (7900 units of 10,000 units) have been completed. Considering this additional information, the program appears to be in trouble. However, this conclusion and any possible management corrective actions are subject to the impact of the following conditions.

## MONTHLY OPERATING BUDGET STATUS REPORT
## FOR PROGRAM X
## FOR PERIOD ENDING 30 SEPT 1972

| OBJECT CLASS | DESCRIPTION | EXPENDITURES From 1 Sept. Thru 30 Sept. | | VARIANCE | EXPENDITURES FY Year-To-Date | | VARIANCE |
|---|---|---|---|---|---|---|---|
| | | PLANNED | ACTUAL | | PLANNED | ACTUAL | |
| 11.1 | Gross Regular Employees | 1,600,000 | 1,730,000 | -8.1% | 5,340,000 | 5,229,000 | +2.1% |
| 11.2 | WAE Employees | 40,000 | 40,000 | 0.0% | 120,000 | 130,000 | -8.5% |
| 11.4 | Overtime and Holiday Pay | 16,000 | 16,000 | 0.0% | 40,000 | 41,000 | -2.5% |
| 21 | Travel & Transportation of Persons | 50,000 | 60,000 | -20.0% | 160,000 | 176,000 | -10.0% |
| 23 | Rent, Communication And Utilities | 60,000 | 58,000 | +3.3% | 200,000 | 196,000 | +2.0% |
| 24 | Printing & Reproduction | 16,000 | 12,000 | +25.0% | 50,000 | 40,000 | +8.0% |
| 99 | Program X Totals | 2,000,000 | 2,100,000 | -5.0% | 7,500,000 | 7,400,000 | +1.2% |

Figure 7

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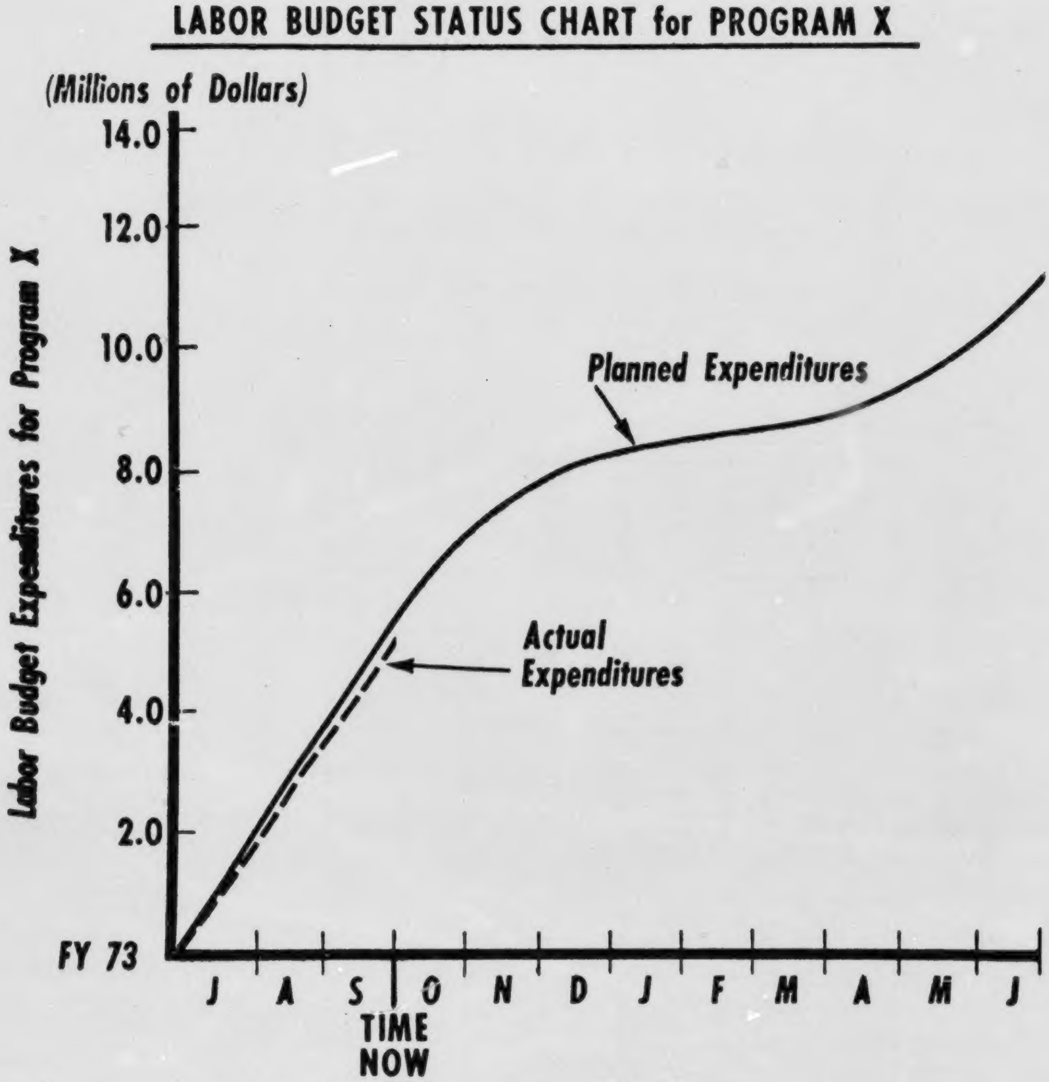

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Figure 8

- The information on workload accomplishments is developed only quarterly and not available until several weeks later. With reporting of this frequency, it is often already too late to take expeditious corrective action if a problem is detected.

Program X
Quarterly Workload Progress Report
For Period Ending 30 Sept. 72

| Project Level Work Units | Accomplishments | | Variance |
|---|---|---|---|
| | Planned | Actual | |
| Unit X1 Completed | 5,000 | 3,500 | -30% |
| Unit X2 Completed | 3,000 | 3,100 | +3% |
| Unit X3 Completed | 1,500 | 900 | -40% |
| Unit X4 Completed | 500 | 400 | -20% |
| Program X Work Units Completed | 10,000 | 7,900 | -21% |

Figure 9

- The original budget in support of the planned workload was not based on quality work measurement standards. Thus, it is difficult to determine if the work performance has been poor, the original budget estimates were inaccurate or some combination of both.

- Work measurement standards are not used by budget analysts to convert actual output into standard hours before comparing them against planned output expressed in standard hours. Thus, it is difficult to determine the status on performance since there may be considerable distortion if the workload mix has changed to any significant degree from that planned (e.g., processed fewer X1 units than planned to increase production of time consuming X2 units).

Because of them, or combinations of them, it is extremely difficult to maintain tight control over expenditures for manpower with fund control oriented reporting. It is difficult to detect if a real problem exists and to identify its source.

(22.) If I get your message, budget analysts must be concerned with costs if they are to be able to predict the need for funds!

## 6. COST CONTROL REPORTING

Right on! Now let's look at cost control approach to see how the effect of several of these difficulties can be reduced.

Figure 10 illustrates a labor performance budget report for Program "X". This report covers the same period as do the reports shown in Figures 7 and 9. The information included in Figure 10 is defined as follows:

- Project level work units (col. 1) were selected and corresponding work measurement standards (col. 2) were developed for budgetary purposes based on historical data.
- Planned workload (col. 3) is based on the schedules developed by operating level workload planning and control personnel. Schedules are developed using detail and summary level standards.
- Actual workload accomplishment (col. 4) is the cumulative of work units reported as complete by operating level personnel to date.
- Planned manhours (col. 5) are calculated by multiplying the standard (col. 2) by the planned workload accomplishment (col. 3).
- Earned manhours (col. 6) are calculated by multiplying the standard (col. 2) by the actual workload accomplishment (col. 4).
- Actual manhours (col. 7) are the cumulative manhours reported as expended to date.

## LABOR PERFORMANCE BUDGET STATUS REPORT
## FOR PROGRAM X

Period Ending 30 September 1972

| Project Level Work Units (1) | Standard MH/Unit (2) | Workload Accomplishment | | Manhours | | | Labor Conversion Rate (8) | Expenditures | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Planned (3) | Actual (4) | Planned (5) | Earned (6) | Actual (7) | | Planned (9) | Value Earned (10) | Actual (11) |
| Unit X1 Completed | 20 | 5,000 | 3,500 | 100,000 | 70,000 | 100,500 | $9.00 | $900,000 | $630,000 | $904,500 |
| Unit X2 Completed | 50 | 3,000 | 3,100 | 150,000 | 155,000 | 164,410 | 10.00 | 1,500,000 | 1,550,000 | 1,644,100 |
| Unit X3 Completed | 100 | 1,500 | 900 | 150,000 | 90,000 | 127,850 | 10.00 | 1,500,000 | 900,000 | 1,278,500 |
| Unit X4 Completed | 200 | 500 | 400 | 100,000 | 80,000 | 97,900 | 11.00 | 1,100,000 | 880,000 | 1,076,900 |
| Non-direct | --- | --- | --- | 62,500 | 62,500 | 62,000 | 8.00 | 500,000 | 500,000 | 496,000 |
| Total | --- | 10,000 | 7,900 | 562,500 | 447,500 | 552,660 | --- | 5,500,000 | 4,460,000 | 5,400,000 |

Figure 10

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- The labor conversion rate (col. 8) is multiplied by the planned manhours (col. 5) and earned manhours (col. 7) to obtain the planned expenditure (col. 9) and value earned (col. 10) respectively.

- Actual expenditures (col. 11) are the cumulative labor dollars reported as expended to date.

Figure 11 is the same as the chart in Figure 8 with the addition of a "value earned" line for the past three months (the total for Col. 10 in Figure 10). The interpretation of the "Planned" and "Actual" expenditures lines is self-explanatory. The "value earned" line is the value of work actually performed expressed in original planned budget dollars.

The budget status reports in Figures 7, 10, and 11 provide three types of information.

- Funds Status. Comparisons between "planned" and "actual" expenditures for labor and other expenditure items (e.g., printing and reproduction) in Figures 7 and 10 do not indicate any funding problem. Comparison between the "planned expenditures" lines and the "actual expenditures" line in Figure 11 does not indicate any unfavorable trend. This conclusion is the same as that described under "funds control reporting" above.

- Schedule Status. Comparisons between "planned" and "value earned" expenditures for labor in Figure 10 indicates a schedule slippage. For the total program, the dollar value of this slippage is \$1.04M (\$5.50M - \$4.46M). Management now knows that Program "X" has potentially serious problems in getting the programmed workload accomplished which may impact on future funding requirements. Comparison between the "planned expenditures" line and the "value earned" line in Figure 11 also indicates an unfavorable trend. However, before management can be certain of the magnitude of any potential funding or scheduling problems, it is necessary to see if the organization is "gettings its money's worth."

- Cost Status. Comparisons between "actual" and "value earned" for labor in Figure 10 indicates that labor costs for the work which has been done are running at an un-

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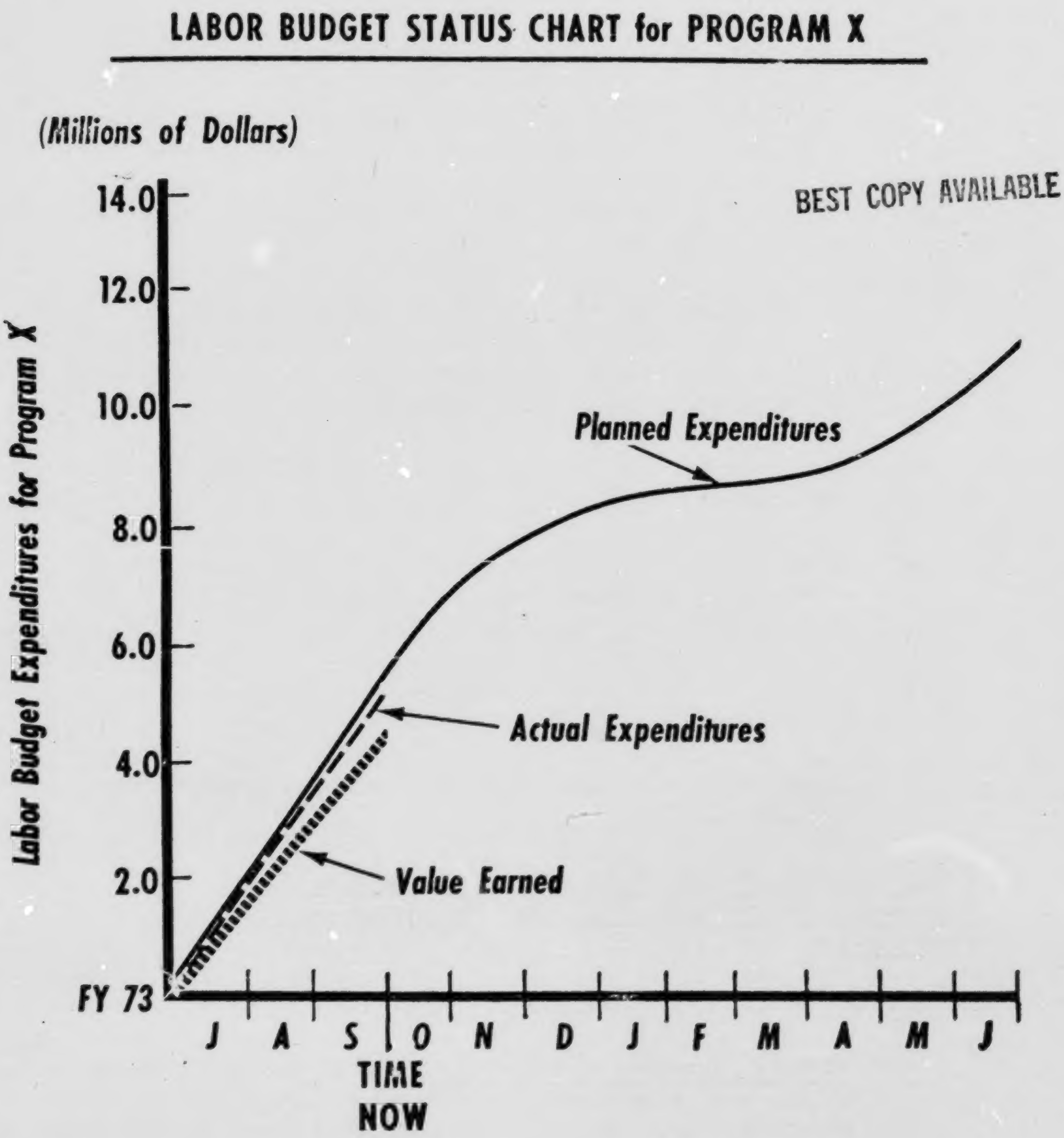

Figure 11

favorable rate. For the total program, the cost overrun to date is $0.96M ($5.40M - $4.46M). Management now knows that Program "X" is in trouble because schedules are slipping and for each dollar spent, less than the programmed budget value is being received. Comparison between the "actual expenditures" line and the "value earned" line on Figure 11 also indicates an unfavorable trend.

23. The "value earned" concept is the key to both effective funds control and cost control as I see it. Am I right?

Yes, and quality work measurement standards are the best way to compute "value earned." Budget organizations that apply this concept via their performance budgets generally have the capability for the type of analysis I just described. The following benefits are derived from use of performance budgets:

- Increased discipline in the final budget formulation process is evident because organizations are required to correlate budget requirements with planned workload accomplishments in quantitative terms.
- More orderly evaluation of proposed budgets or budget changes is possible.
- Improves the ability of an organization to determine whether the workload is being accomplished for the planned resource expenditure.
- A valid baseline is provided for assessing actual performance.
- Sources of problems are easier to identify and tend to surface earlier.

24. Budget processes get pretty complex at times. At least they appear that way to me! Will you summarize the key elements of cost control?

Of course I will. There are three:

- Timely reporting of expenditures is required by object class, and work units. Most organizations collect costs by object class, by program and project on a timely basis because regulations or procedures demand that they do so. Organizations with performance type budgets also collect costs periodically (e.g., every two weeks) by work units. However, they frequently experience difficulty in getting budget status reports back soon enough to be useful for cost control.

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- Timely reporting of workload accomplishments by work units is necessary. Organizations without performance budgeting often experience significant delays in reporting workload accomplishments. Organizations with performance budgeting generally experience shorter delays.

- Quality work measurement standards are the foundation for effective cost control. They provide the baseline or "yardstick" essential to plan and control budgets that are "realistic".

## B. MANPOWER PLANNING AND CONTROL

㉕ Very interesting. Now, how does manpower planning and control differ from budget planning and control? In my organization, they are really highly integrated.

As shown in Figure 2, there are many similarities between the budgeting and manpower functions. In fact, the planning and control of manpower and budgets are highly integrated in many organizations; however, the functions are essentially independent in some organizations.

### 4. INITIAL MANPOWER PLANNING

As in the Initial Budget Formulation phase, most organizations do not utilize detailed standards to determine either the funding or manpower requirements. This is because the amount of resources appropriated are often substantially less than those requested. Instead, most organization's manpower planning requirements are determined by using judgment to modify the previous year's manpower to accommodate anticipated changes in workload.

Manpower requirements, together with the budget request and supporting justification, are submitted to OMB and Congress for approval. In most cases, the manpower requests include only the manning required to achieve the next fiscal year's workload forecast.

(26.) We operate that way. The OMB budget examiner complains about it. He says we don't adequately justify our manpower requirements.

To assure realistic manpower planning, quality work measurement standards should be utilized to the maximum extent possible. For those areas where it is not economically feasible to establish standards at the detail level, gross hostorical standard and staffing ratios should be employed for manpower planning purposes.

(27.) That sounds good, but does it work and what would be the advantage in using them?

I would like to cite two examples that illustrate the advantage of manpower planning using quality work measurement standards.

One civilian organization includes in their budget formulation, manning requirements based on multi-year workload forecasts in one area with a constantly expanding workload. This workload requires personnel who have received long-term specialized in-house training. Therefore, these manpower requirements are based on workload forecasts three years in the future. This lead time is necessary to assure that sufficient numbers of these highly skilled personnel will be available when required. Work measurement standards are used as basic input data to a computerized "advance recruitment model" which determines the level of these future manpower requirements. With the use of quality work measurement standards, this organization has been able to gain approval of the manning levels requested.

Another organization finds that a major payoff from the use of work measurement standards in manpower planning occurs when standards are utilized to assess the manpower impact of transfering workload into their organization from another. This organization reports that in earlier years (prior to having extensive work measurement standards coverage) they would accept the transfer of workload and manpower spaces based on the transfering organization's estimates. Frequently, after acceptance of the additional workload, it was discovered that the estimated manpower to accomplish the work was inadequate. However, with their current work measurement system (based on detailed, engineered work measurement standards), they are able to accurately determine the manpower required to accomplish transfers in workload.

## 2. MANPOWER ALLOCATIONS

Let's briefly cover manpower allocation now.

28. All right!

Work measurement standards are used extensively in the process of allocating (or distributing) the available manpower and spaces throughout most organizations. Similar to budget allocations, the allocation of available manpower spaces starts at the organization headquarters level and cascades down the organization structure utilizing the appropriate level of work measurement standards and staffing ratios at each organizational level. To eliminate the possibility of conflicting manpower requirements being determined, a hierarchy of work units to interrelate the standards used at each organizational level is commonly employed.

29. Hold it! You lost me. I don't know what you're talking about. Levels of standards.........hierarchy of work units........ where did they come from?

As will become clearer to you later, successful work measurement systems usually require the use of several levels of work units and related work measurement standards. Right now though, I only want to emphasize the benefits of using quality work measurement standards in manpower allocation.

As in budget allocation, organizations with high quality standards and staffing ratios experience significantly less replanning and reallocation of manpower than do organizations with less accurate measurements.

## 3. FINAL MANPOWER PLANNING

30. I'm with you again.

Detailed work measurement standards are used to convert the short term forecasted workload into the final manpower planning requirements. Most organizations accomplish this as a part of the workload planning and the control function that we will discuss shortly. For this reason, I won't dwell on it here.

## 4. MANPOWER CONTROL

(31.) I seldom get involved at this level of detail!

Probably not. Now manpower control often involves several organizational levels. At the field or operating level, workload planning and control systems are directly involved. Additionally, all organizational levels utilize periodic manpower reports which enable comparisons between planned or authorized and actual manpower staffing levels. These reports are used to monitor compliance with higher authority manpower allocations and other imposed control requirements (e.g., average grade reduction and cuts in manning levels).

(32.) I sure get involved with some of these problems. It sometimes seems as though manpower reductions are more important than accomplishing the mission.

Several organizations in the government have found it to their advantage to establish systems of control over manpower in addition to those imposed by budgetary ceilings and the other controls established by OMB and Congress.

(33.) I've heard about some of them. Haven't some organizations established a separate manpower management function that is organizationally separated from budgeting.

That's right. This function utilizes several techniques to plan and control manpower utilization and space allocations. One of these techniques is the use of manpower surveys.

The purpose of a manpower survey is to audit manpower needs to assure efficient and effective utilization of manpower resources. These periodic surveys consist of an on-site review by trained survey analysts of an organization's mission, workload, and its utilization of personnel. The analysts rely heavily on work measurement standards to assist them in making decisions concerning the proper manpower levels for the organization under review. Both the forecasted workloads and the work measurement standards are reviewed by the survey team to assure that the manpower levels are commensurate with the workload to be accomplished. Often this leads the survey team to question the accuracy of the forecasts or the validity of the standards.

One organization has modified this concept of manpower audits. Specially trained measurement analysts are used to develop manpower staffing standards. These standards, covering both direct and non-direct labor are used to allocate manpower that is commensurate with assigned mission workloads. These high quality work measurement standards (including staffing ratios) are based on direct observation of operations, not just evaluation of historical data. Application of this concept has proven to be an effective manpower control technique since it can "weed out" past inefficiencies.

(34.) Our organization could use a little "weeding out" of inefficiencies. But it's hard to find out where the weeds are!

It usually is. But this is where work measurement can be particularily useful. Work measurement can be used to identify and isolate areas of inefficiency. Then methods and procedures studies can be made to improve operations. The modified manpower audits we have just talked about are examples of this kind of activity.

Now, I'd like to talk about the need for standards in the function of workload planning and control.

## C. WORKLOAD PLANNING AND CONTROL

### 1. DETAILED WORKLOAD PLANNING

Workload planning and control includes the management functions involved in planning for and controlling the accomplishment of mission work by an operating or field level organization. There are several workload planning functions that are best accomplished when quality work measurement standards are employed.

- Methods and procedures planning (to evaluate alternatives).
- Planning resource requirements (to compute the manpower needed for a specified amount of workload).
- Developing schedules (to balance workload against available manpower during a specified time period.)

(35.) I know that standards are currently used in several of my subordinate organizations for these purposes.

That's encouraging to hear, but not too surprising. Traditionally, work measurement has made its greatest contributions in these types of functions, not in the budgeting and manpower processes we discussed previously.

(36.) No doubt about that in my organization!

The important point here is the need for quality work measurement standards if these functions are to be performed most efficiently and effectively. The value of quality work measurement standards for detailed scheduling can best be demonstrated utilizing an example from a civilian organization.

At one time, workload schedules for field levels operations of this organization had to be continually revised because work assignments were not properly correlated with resources. As a part of the investigation to discover the cause of this probelm, the engineered standards then in use were carefully reviewed. It was determined that many of them were no longer valid since they did not reflect current methods and procedures. Subsequently, the standards were revised to bring them up-to-date. Using the revised standards, the need for replanning of workload schedules was significantly reduced.

(37.) One of my field organizations recently implemented a highly automated scheduling system. They have found it necessary to keep all the standards right up-to-date, or the system won't work. I'm not sure it will ever pay off.

It may comfort you to know that several organizations have implemented highly automated scheduling systems, found it necessary to develop and maintain high quality standards for nearly all of the workload, and have done so successfully.

38. I'm glad to hear this. How do they do it?

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As you know, most organizations try to vary the intensity of workload planning and control devoted to each element of workload. Thus, the level of effort expended to plan and control work that will consume critical or large amounts of resources is greater than for work which does not. One organization that utilizes a sophisticated and automated workload planning and control system has formalized this process.

This particular organization has a maintenance mission. The workload encompasses a wide variety of items ranging from the overhaul and modification of complex equipment to simple one-step repair operations for parts and service assistance to customers with no resultant product. In addition, the workload quantities required during any given time period are highly variable. A careful analysis of one year's workload revealed that 80% of the work was generated by only 10% of the items. Also, more than two-thirds of the items accounted for only 3% of the manhours expended.

To insure efficient use of their resources in meeting such a wide variety of requirements with fluctuating demands, this organization has formally established procedures within their workload planning and control systems which tailors the effort employed in management of an item to the minimum required. Three levels of management are used as follows:

> Level 1 Workload: This workload receives the detailed planning and control necessary for total management visibility. Schedules are developed on a computer using detailed engineered standards.
>
> Level 2 Workload: This workload receives limited management attention. Planning and control of this workload is supported by historically derived standards and it is normally scheduled on the computer.
>
> Level 3 Workload: This workload receives minimum management attention. Planning and control of this workload is based on technical estimates and it is not scheduled using the automated system. It is normally accomplished during "slack" periods.

The standards in each case are tailored to be compatible with the specific needs and intensity of management desired. This tailoring of the standards enables the work planning and control system to function most effectively and efficiently with the available resources.

(39.) How has this system worked out?

They report that since the adoption of this system, much unnecessary planning effort formerly devoted to one time short-run jobs has been eliminated. The use of formally documented policies and procedures has made this possible.

(40.) I'll have to check and see if anything like this is being done in that field organization I told you about. What's next?

## 2. WORKLOAD CONTROL

One of the important responsibilities of a manager, of course, is to review past performance to determine how things have been going and identify areas in need of corrective action. To support these activities, most managers are subjected to a variety of reports.

(41.) Too many reports!

One area of interest to managers at all levels; in addition to getting the work out on time, is how efficient everyone was in doing his job. This is particularly important where manpower represents a large part of the budget. Organizations with work measurement systems commonly produce some form of manpower efficiency report similiar to the one illustrated in Figure 12. This particular report is designed for the first line supervisor. It illustrates the major sections of a report provided daily to each work center.

Column 1 identifies the function; column 2 - the actual hours expended (total of 54.6); columns 3 and 4 - the detailed standard code and work unit; columns 5 and 6 - the actual work units accomplished and the standard time for each work unit; and column 7 - the earned hours for the work units accomplished (at the standard time per unit). This detail level data is summarized as the bottom line entry, which, in this example, totals 50.2 standard hours. By comparing actual hours expended (54.6) to standard hours (50.2), the performance efficiency is determined to be 92 percent. Columns 9 and 10 - show manpower spaces actually used (6.8) and manpower spaces that should have been used (6.3). This feedback report to the supervisor serves as a primary management tool at the work center. It also provides the basis for performance data summarization for higher management levels.

## Workcenter Level Performance Efficiency Report*

Work Center (daily)

| Cost Account | Actual Hours | Standard Code | Standard Work Unit | Actual Units | Standard Time | Standard Hours | Percent Efficiency | Actual Spaces | Standard Spaces |
|---|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| 32, 110.02 |  | 6001 | Railcar | 1 | .915 | .9 |  |  |  |
|  |  | 6002 | Container | 367 | .008 | 2.9 |  |  |  |
|  |  | 6003 | Truck | 27 | .315 | 8.5 |  |  |  |
|  |  | 6004 | Container | 1,444 | .012 | 17.3 |  |  |  |
|  |  | 6005 | Container | 335 | .021 | 7.1 |  |  |  |
|  |  | 6006 | Pallet | 111 | .122 | 13.5 |  |  |  |
|  | 54.6 |  | Total |  |  | 50.2 | 92 | 6.8 | 6.3 |

Figure 12

*These examples were obtained from one of the organizations included in the study as documented in "Guidelines for Evaluating Work Measurement Systems in the Federal Government," dated July 1972 which was developed under the Joint Project for Measuring and Enhancing Productivity.

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(42.) I have no need for a report like that! It's too detailed.

You probably don't, and it is too detailed for your level. However, it contains basic data that can be combined with other data to produce reports that are appropriate for your use. This is important because it means that all levels of management are reading from the same "sheet of music." Without a properly designed work measurement system, which we'll talk about later, integrated reports of this type cannot be prepared.

(43.) Do you have an example of this level of reporting?

Figure 13 is typical of a summary level performance report.

The Summary Performance Report shown contains three groups or categories of data concerning major output unit Z.

- o Workload/Production (outputs)
- o Resources Applied (inputs)
- o Performance Evaluation (outputs versus inputs)

Each category of data is displayed for the past fiscal year, the current fiscal year and the most recent 13 month period. Arraying the data in this fashion enables the reviewers to quickly and easily assess trends.

The workload/production data includes the total and average daily units of output over specified periods of time.

The resources applied (or inputs) data includes both the equivalent manpower inputs and the average daily costs for personnel and non-personnel.

Performance evaluation data includes the following information:

- o Actual Rate - average time per unit of output for the reporting period in question.

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## SUMMARY PERFORMANCE REPORT*

| Output Unit: Z | Past FY actual | Year to date | March | April | February |
|---|---|---|---|---|---|
| | WORKLOAD/PRODUCTION | | | | |
| Output Units (thousands) | | | | | |
| Total | 1770 | 1052 | 176 | 171 | 129 |
| Daily Average | 7.02 | 6.26 | 8.40 | 7.77 | 6.80 |
| | RESOURCES APPLIED | | | | |
| Manpower | | | | | |
| Prod Equiv | 183.0 | 176.8 | 208.5 | 194.8 | 202.8 |
| O/T Equiv | 2.2 | 5.3 | 5.6 | .9 | 18.3 |
| Cost/Daily Avg (thousands) | | | | | |
| Total - Pers | 6.35 | 6.35 | 7.35 | 6.90 | 6.41 |
| Civilian | 6.16 | 6.12 | 7.19 | 6.71 | 6.18 |
| Military | .18 | .23 | .17 | .19 | .23 |
| Non-Pers | .01 | .01 | .01 | .01 | .01 |
| Total Oper | 6.35 | 6.35 | 7.37 | 6.90 | 6.42 |
| Total O & M | 6.17 | 6.12 | 7.20 | 6.71 | 6.19 |
| | PERFORMANCE EVALUATION | | | | |
| Productivity | | | | | |
| Actual Rate | .208 | .225 | .198 | .200 | .238 |
| Std Equiv | 183.5 | 163.6 | 219.6 | 203.0 | 177.7 |
| Perf. Eff. | 100.2 | 92.5 | 105.2 | 104.1 | 87.6 |
| Cost Effect | | | | | |
| Unit Cost | .90 | 1.01 | .87 | .88 | 1.01 |

FIGURE 13

- Standard Equivalent - the earned manhour (i.e., in the amount of manpower it should have taken to complete the workload accomplished according to the standard) for the reporting period.

- Performance Efficiency - the ratio of Standard Equivalent to the actual manpower (i.e., the ratio of earned to actual manhours).

- Unit Costs - the ratio of the total average daily O&M costs to the daily average output units for the reporting period (i.e., cost per unit of output).

This Summary Performance Report serves as a barometer for assessing changes in the workload/resources relationships and is the primary top level management tool for appraising resource utilization in the organization which currently uses it.

## (44.) I already get quite a bit of this type of information!

Most managers do. It is important, however, that this information be developed from a common data base to assure that it is possible to:

- Relate one element of information to another.

- Track the progressive summarization of data from the detailed operating level to progressively higher levels of summarization.

## (45.) Didn't we talk about a way to relate performance measurements earlier?

Yes. The best way is to use a common work unit for all performance measurements that you want to relate.

The development and use of "factual" reports at all levels on the utilization of manpower resources is dependent on the availability of quality work measurement standards. High quality standards provide a valid baseline for any assessment of performance. Without them, it's difficult to know whether performance is what it should be.

46. I'd like to get a point straight in my mind about manpower performance efficiency reporting. One of the reports that comes across my desk every month gives the performance efficiency (we called it percent efficiency) for the field organizations with the automated workload planning and control system I told you about earlier. I've never paid too much attention to it, mainly because I don't think it tells me much. But, whenever I do, the director of that organization gets all upset.

Why is that?

47. He and his staff believe that managers outside his organization have no need for information of this type. They claim there are no corrective actions available at higher levels which can directly improve this aspect of his operation. This director considers that manpower performance efficiency measurements are only useful as an internal management tool for a field level organization. According to him, performance efficiency is very useful as a means to get first line supervisors interested in efficient use of manpower. Lower level organizations and work center supervisors now routinely shift manpower resources in order to assure a high performance efficiency. They know this is what their top management wants and they know their performance is judged on how successful they maintain peak efficiency in the use of manpower.

This reaction of operating level management to the submission of manpower performance efficiency information to higher levels is not unusual and is based on several natural concerns. One is that the information will be used to compare them against other organizations which are not comparable. Another is that management or staff levels outside the performing organization cannot properly interpret the information and, finally, that the report doesn't tell higher management levels anything anyway.

48. What do you think?

First, higher management levels should not forget that manpower performance efficiency is only one of the efficiency performance measurements. Consequently, interpretation of this measure should be assessed in the light of other efficiency and performance measurements.

Secondly, comparison between organizations using performance efficiency measures should be done very cautiously. It is not fair to compare apparently like-organizations or functions that are really different. Where comparisons are unfairly made, it leads to resentment, and this rarely leads to improved operations, only alibiing.

49. O.K., but would there be any benefit if I make comparisons in the manner you suggest?

Most certainly. When people know they are being measured and compared fairly, it is natural for most of them to try and do better. One of the civilian organizations is deriving considerable benefit from such comparisons. This organization performs similar work in several offices scattered throughout the country. Uniform standards are used by all offices to the maximum extent possible. The standards are used for detailed workload planning and control. The manpower performance efficiency reports generated are forwarded to the headquarters where comparisons are made between offices. When the performance of an office shows a consistant pattern above or below the norm, conferences are held with representatives of the various offices. These conferences are used to exchange ideas on how to help the consistently low performer or determine how an office can consistently perform above the average. Through this exchange of ideas, method improvements are made and the work cycle is shortened at all offices.

50. I think this would work in my organization!

Where organizations are not sufficiently similar to permit valid comparisons between them, benefit can still be derived from these reports by establishing performance goals for each organization and measuring their performance against these goals.

51. Would this be management by objectives?

I suppose it could be considered this, although I don't think it should be overstressed as an end in itself. It is really only one indicator of how things are going.

(52.) Right!

There is another important consideration. This relates to the predominate technique of work measurement in use at the operating level. If engineered standards are in use, performance efficiency measurements at any organizational level are more meaningful than if only historical standards are in use at the operating level. This is because the historical standards which are the baseline for comparison have the same inefficiencies built into them as does actual time. Thus, comparisons between earned hours and actual hours is unlikely to be particularly meaningful. Organizations or work centers using engineered standards can also develop considerable distortion in their performance efficiency measures when the percent of workload covered by engineered standards drops to low levels. This is not to imply that engineered standards are to be preferred. The point is that the interpretation of performance efficiencies for an organization should be tempered by a knowledge of the amount of workload covered by engineered standards.

(53.) I don't follow you on this.

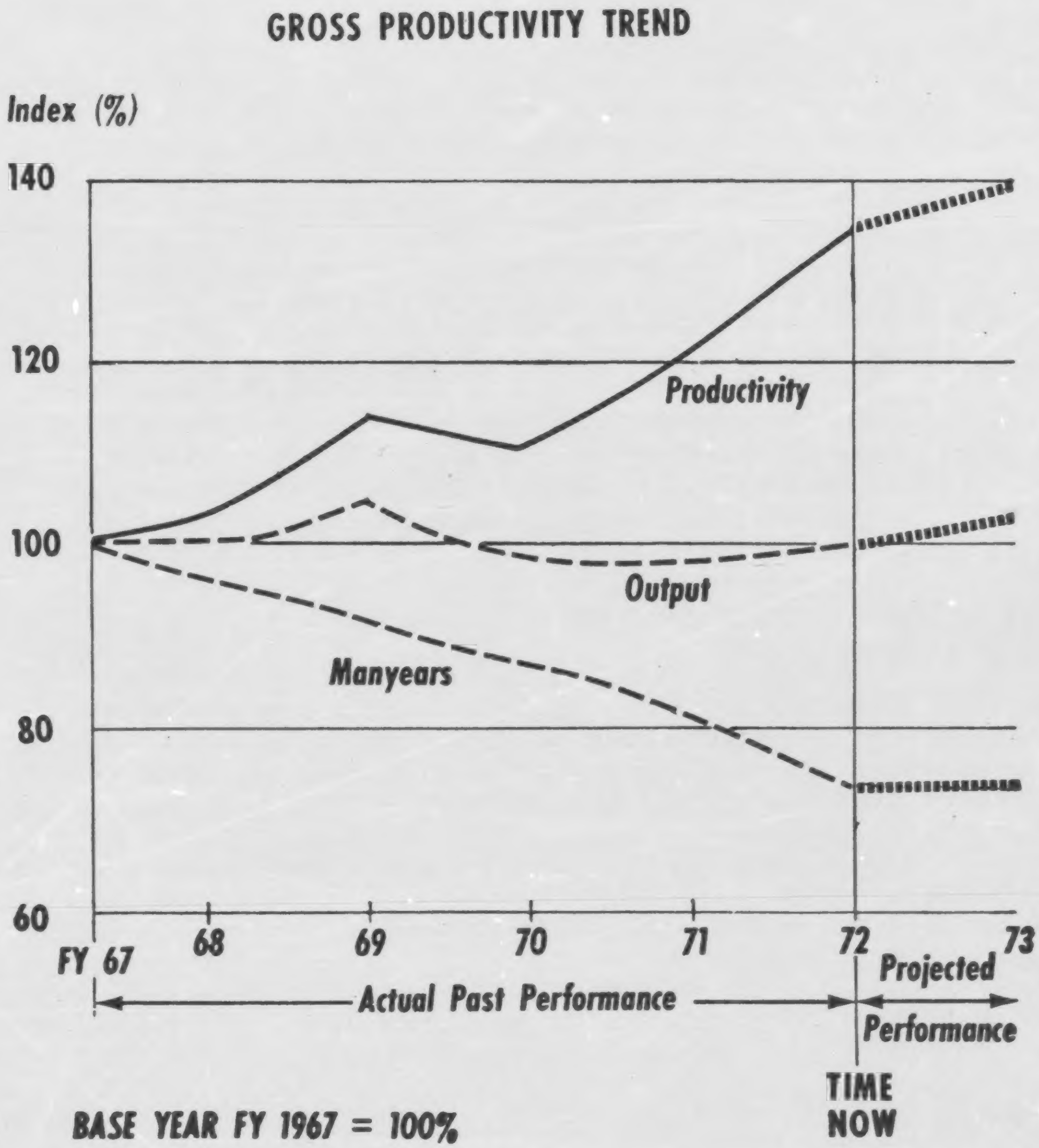
Engineered standards are the "should take" time to perform work. Historical standards are the "did take" time to perform work as found from historical records. Historical standards include the inefficiencies of past performance in the standard time, whereas, engineered standards do not.

Where engineered standards are in use, performance efficiencies tend to vary considerably (up to 20%) from 100%. Where historical standards are in use, performance efficiencies should be expected to run close to 100%.

We'll talk more about characteristics of work measurement standards when we discuss work measurement techniques later.

(54.) What other manpower efficiency measurement would be useful at my level?

Figure 14 illustrates the use of productivity indices incorporating a measurement of manpower efficiency. A performance index has been developed for manyears (input), units of output, and productivity (the



ratio of output over input in manyears). The chart indicates that while the output has remained fairly constant over the last five years, the manpower employed has decreased. Thus, the productivity has increased and is reflected in the productivity line.

(55.) That looks like a pretty good chart. It's just the kind of summarized information I need.

The increase in productivity has been brought about by many factors. Improved methods and procedures, new and better equipment, an automated workload planning and control system at the operating level and work measurement made a significant contribution in achieving these results.

(56.) It sure sounds good!

Let me summarize at this point. First, workload planning and control systems need quality work measurement standards to:

- Provide a valid data base for detailed planning of efficient methods and procedures.
- Permit formulation of realistic and accurate workload schedules.
- Provide a firm baseline against which actual performance can be assessed, thus permitting improved control.

Secondly, your organization needs work measurement. Quality work measurement standards can lead to improved budget, manpower, and workload planning and control processes. They can provide benefits both at the detailed operating level where they have traditionally been used, and also at higher management levels. These higher levels are where the results of work measurement applications have yet to be used to maximum advantage in most organizations.

# CHAPTER III

# ESTABLISHING A WORK MEASUREMENT SYSTEM

## A. PRELIMINARY CONSIDERATIONS

1. O. K., now I understand that I need quality work measurement standards. How do I go about establishing a work measurement system (or assuring myself that the one I have is efficient and effective)? See, I already know how to use these fancy words, and I know what they mean too.

Very good. Well, to begin with, the initiation of a work measurement system in a successful manner requires careful advance planning. Goals and objectives need to be established, plans developed, resource requirements must be identified, staffs trained, and information systems designed or modified to assure effective use of the work measurement standards that will be developed. Work measurement represents a sizeable investment in most instances. It should not be undertaken without a full consideration of what must be done, what it will cost, and what quantitative and qualitative benefits can be expected to accrue.

2. This sounds like a lot of work!

It is, but it is required for any investment, and work measurement does represent an investment. Careful advanced planning is a must. Without it, efforts in this area are likely to fail.

3. What's the first thing I need to do?

Success in establishing or operating a work measurement system is highly dependent on getting key managers and staff specialists at the headquarters level involved. This will assure top level support and visibility for work measurement on a continuing basis.

4. And just how would you suggest I do that?

To initiate a comprehensive work measurement system, an ad hoc headquarters level work measurement steering committee should be established as follows:

- Mission - establish top level policy guidance.
- Membership - headquarters level functional and operating directors and key work measurement staff members.
- Chairman - executive director or equivalent.
- Benefits - gain top management support and assure coordination of work measurement activities throughout the organization.

## ⑤ Who are these "key work measurement staff members"?

An agency headquarters level work measurement staff is needed to assure successful work measurement systems throughout the organization. The mission should be:

- Provide top-down centralized policy and procedural guidance.
- Develop top levels of a hierarchy of work units for the agency.
- Monitor and approve the extension of this hierarchy of work units to the lowest levels of the agency.
- Monitor and periodically review the operation of agency work measurement systems, validate the quality of the standards, and assess the utilization of standards.
- Review methods and procedures study activity.
- Participate in steering committee activities.

It's very important that these work measurement staff personnel actively participate with headquarters level managers of functions utilizing work measurement systems. This will assure top level support of work measurement systems on a continuing basis.

⑥ What's a hierarchy of work units?

I'll explain this a little later when it should be more meaningful to you.

⑦ All right......

## B. THE SYSTEMS DESIGN APPROACH

Perhaps we should talk about the basic approach that should be used to get a work measurement system designed and implemented. First of all, there will probably be a need for more than one work measurement system in an agency, as you know. Most agencies are actually conglomerates of several major missions. Each mission is assigned to a major organization element; with each element operating largely independently of other organizations in the agency. Because of the wide differences in mission, products or services produced, and methods, equipment, facilities, and skills utilized in each organization, no single work measurement system will serve management needs. It is necessary to tailor each system to the needs of the organization.

⑧ But integrated with the needs of the agency headquarters level.

Very good! Past experience has shown that success in the design and implementation of a useful work measurement system is highly dependent on the application of a deliberate "top-down" (centralized) management systems design approach combined with aggressive and sustaining top management support. This should normally be accomplished by personnel from the organization that will use the system, with centralized policy guidance and direction provided by an agency headquarters level on a continuing basis.

The design and implementation of work measurement systems should involve experienced personnel from budgeting, manpower, workload planning and control, and electronic data processing; in addition to experts on work measurement. It is very important that the latter understand the management process and how work measurement supports this process.

⑨ Why do I need a management systems design approach? The systems analysts in my organization use this approach for our EDP based management information systems. They've been working on some of these systems for over five years and the systems still don't work right!

That may well be. I guess the best way to answer this is to say that many EDP systems are very complex because we try to do so many things for managers, perhaps too many in some instances. And, a useful work measurement system will do a lot of things for managers--in budgeting, manpower planning, workload planning and control, as we've talked about before. The primary purpose of the management systems design approach is to assure that all the basic elements which are necessary for any system to function, are considered in proper perspective. Additionally, the management system concept (see Figure 15 ) aids in developing higher level integrated systems consisting of combinations of smaller systems. This is often a requirement for work measurement systems. If you're interested, Table 2 contains two examples of management system elements. The design of a work measurement system must consider these elements if a properly integrated system is to be developed. I know---it's getting too technical. Fortunately, the experts thrive on wrestling with such matters. The most important point is:

> "Work measurement systems must integrate the standards into the budget, manpower, and workload planning and control systems. The best way to do this is to use a management systems design approach that involves a deliberate analysis of an organization's mission, workload characteristics and operating procedures to determine the type and form of system that should be developed."

Let's continue by discussing some of the key issues that should be considered when designing or implementing a work measurement system.

# MANAGEMENT SYSTEM CONCEPT

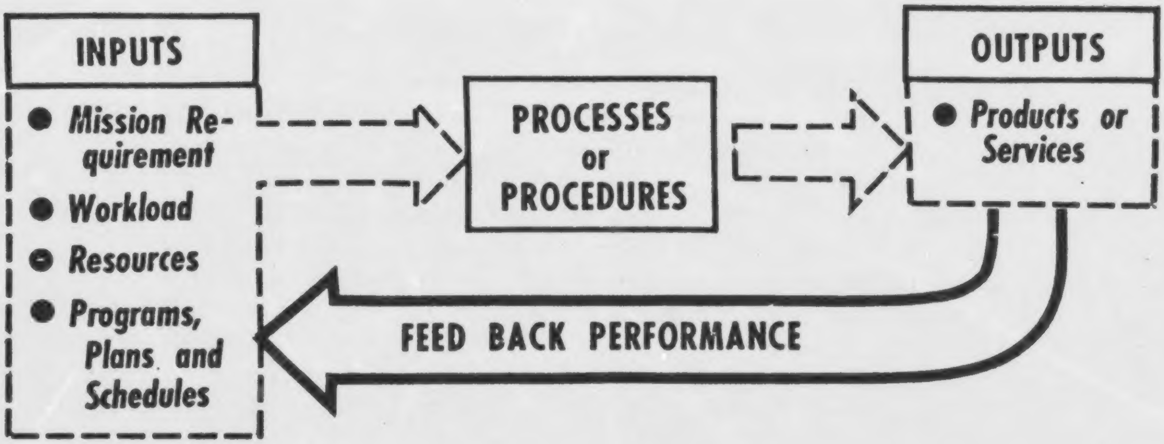

INPUTS
Mission Requirement
Workload
Resources
Programs, Plans and Schedules
PROCESSES or PROCEDURES
OUTPUTS
Products or Services
FEED BACK PERFORMANCE

Figure 15

⑩ What are they?

There are eight of them.

- Areas of Work Measurement Application.
- Work Measurement Techniques.
- Hierarchy of Work Units
- Work Measurement Accounting
- Integrating Methods and Work Measurement
- Quality Work Measurement Standards
- Staffing for Work Measurement
- Training

# TABLE 2

## EXAMPLES OF MANAGEMENT SYSTEM ELEMENTS

(1) The management system for a work methods and standards organization may include the following basic elements:

- o INPUT - Work methods and standards personnel with the requirement to establish standards in organization "X".
- o PROCEDURES - Establish engineered standards.
- o OUTPUT - Work measurement standards. The standard is used to determine the quantity of manpower resource input required by organization "X" using a specified process to produce a unit of output.
- c FEED BACK - Information on actual work accomplishments of the methods and standards organization compared to a plan of accomplishment.

(2) The management system for the budget function in the Office of Comptroller may include the following basic elements.

- o INPUT - Manpower (budget analysts) with the requirement to develop a budget for organization "X" who has a forecasted workload of 10,000 policies to be processed in one quarter.
- o PROCEDURES - Convert forecasted workload into budget manpower and dollar requirements.
- o OUTPUT - Budget for organization "X".
- o FEED BACK - Information on actual workload accomplishment and budget expenditures compared to planned workload accomplishments and budget expenditures.

## C. AREAS OF WORK MEASUREMENT APPLICATION

11. Let's get started on the first one. I've never been sure just where work measurement should be applied.

There are two basic areas to consider. Direct labor and what I call non-direct labor. Non-direct labor includes what you may call overhead, burden, general and administrative (G&A) or something else. The accountants usually establish these categories. Anyway, for our purposes---direct labor refers to personnel whose time is charged against an identifiable product or service that is considered to be a direct mission output of an organization. Because an output measure or work count can usually be identified, all direct labor is usually considered to be amenable to work measurement.

12. I've always considered it impractical to measure many direct labor areas in the government. Where the work is non-repetitive, requires professional or highly skilled personnel, or where the processing time requirements vary greatly between like units of output--to name a few.

It may be difficult and it often involves much more than some analyst running around with a stop watch in his hand. That's largely passe. It has been repeatedly demonstrated that it is practical and beneficial to establish performance measures, including work measurement, in most "hard to measure" areas. These include service type organizations and research and development activities. However, success in measurement is dependent upon judicious selection of an appropriate measurement technique.

13. Some examples would be helpful!

One organization utilizes lawyers to process certain types of cases. Although there are a limited number of types of cases, the number of processing steps and the amount of work required in these processing steps for each case varies greatly. Nevertheless, this direct labor area is successfully covered under a work measurement system utilizing historical standards. These standards are used for budget, manpower, and workload planning and control and are readily accepted by OMB in this organization's budget submissions.

Another organization provides an advisory service to the general public as an element of their mission. Highly trained personnel, classified as direct labor, provide this service. They are widely dispersed geographically and produce a wide variety of outputs, each of which has highly variable processing requirements. Historical standards have been developed that are being successfully used by all levels of the organization for budget formulation, resource allocation, workload planning and performance evaluation.

A third organization produces complex reports with a portion of their direct labor personnel. Each report is different and requires the consolidation of many facts and the compilation of statistics using electronic data processing and other complex manual processes. A system of engineered standard time data has been developed and is used to develop a time standard for each output. The time standard is successfully used to plan and control work activities and it also serves as a basis for an incentive awards program. (See Appendix II for additional details.)

14. What about a research or development type project where each task is done only once and you're not even sure what needs to be done?

In one of the defense organizations, a system* has been implemented for controlling costs, including labor, in research and development type activities. Although this system is not classified as a work measurement system, it has many of the same characteristics. Under this system, project work is broken down into successively smaller units of work (called end items) and finally into the smallest unit of work (tasks) necessary to develop the end item. A typical breakdown is illustrated in Figure 16.

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*See "Cost/Schedule Control Systems Criteria, Joint Implementation Guide". This document is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Stock Number 0870-0318, Price - $1.00.

## PROJECT WORK UNITS

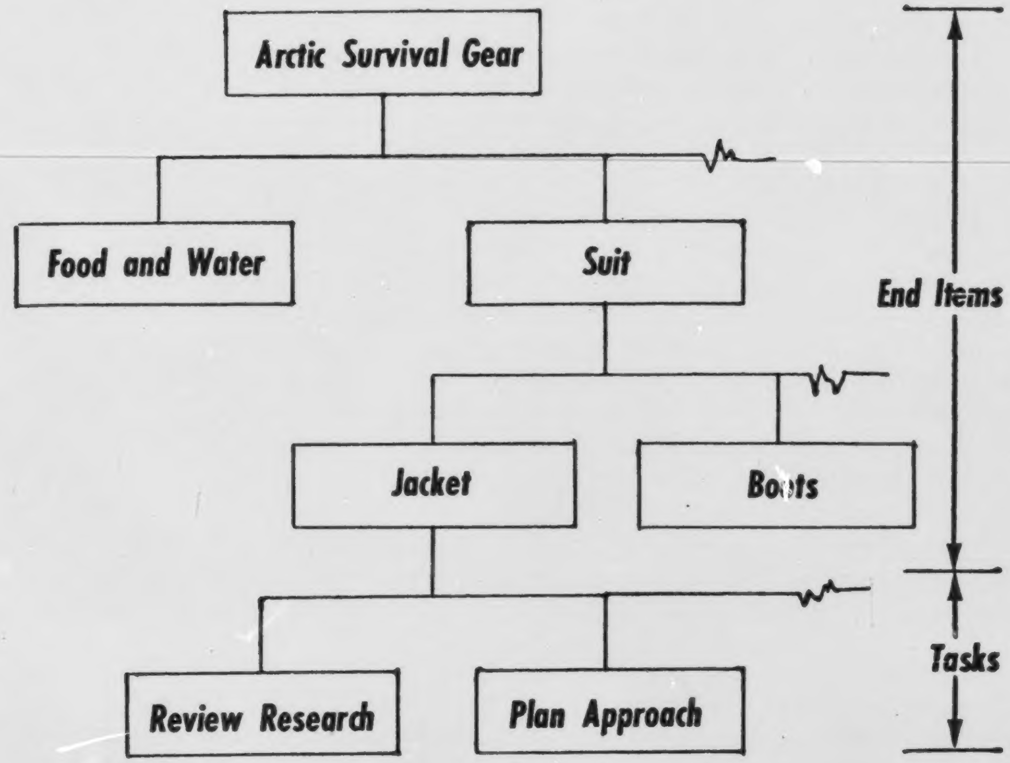
Arctic Survival Gear
Food and Water
Suit
Jacket
Boots
Review Research
Plan Approach
End Items
Tasks

Figure 16

For each task, a time estimate (standard) is developed and a work schedule established. Milestones are also identified at the beginning and/or end of each task. These tasks represent a detailed work unit and upon completion are counted as a measure of output. This concept is illustrated in Figure 17.

As each milestone is completed, credit is given in the form of "earned" hours. These "earned" hours are compared against the "actual" hours taken to complete the milestone. To illustrate, Task 1 (Review Research) has a standard time of 100 hours. At the time the completion milestone is accomplished, the actual hours expended can be compared against this standard to evaluate performance.

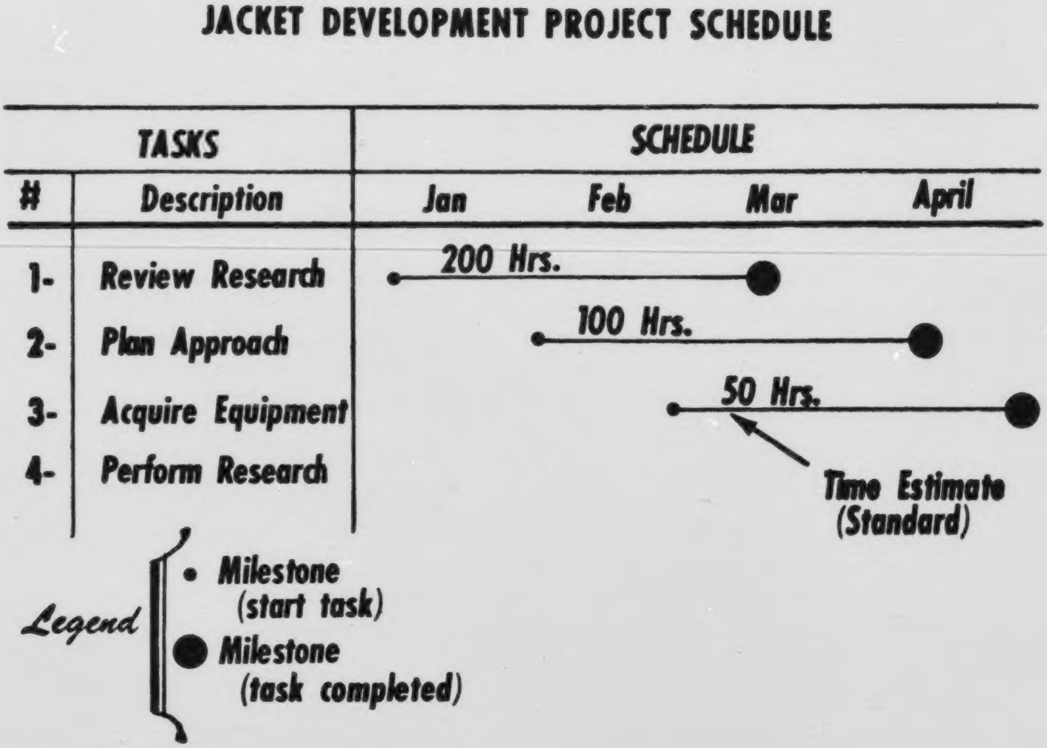

Figure 17

Under this system, standard times and actual times can easily be summarized to any level desired. Although it is a gross measurement system, it does force research and development type organizations to determine work or outputs which will be produced during the life of a project. The system requires the development of work measurement standards, usually technical estimates, and can be economically applied to work which is not repetitive.

There is no reason this concept could not be adopted for use by civilian agencies engaged in any program or project consisting of "one-time" tasks or activities.

(15.) It sounds good. We have several organizations that are involved in what amounts to project type activity. . . But now, about indirect, I mean, non-direct labor. I spend a lot of money for this. I suppose you're going to tell me this is measurable too.

Before I answer that, remember that non-direct labor refers to personnel whose time is not charged against an identifiable product or service that is considered to be a direct mission output of the organization. When non-direct labor results in a countable work unit, the same work measurement techniques normally employed in direct labor areas may be used. However, since it is often difficult or impossible to select a suitable output measure, managers often feel that non-direct labor is not amenable to work measurement.

(16.) I guess I'm one of them.

The tendency is to forget about non-direct labor because it is hard to measure, and zero in on direct labor because it is easier to measure. Sometimes I think we forget that in most organizations, non-direct labor costs are a significant chunk of the total labor costs.

(17.) Mine runs at over 20%. Currently we are using staffing ratios in this area. I consider this to be a form of measurement.

You're right, it is! Staffing ratios are widely accepted for this purpose. Typically these ratios relate the amount of non-direct labor required in relation to another measurement (e.g., direct workload or direct labor hours). One method commonly employed is to develop trend lines based on past experience as shown in Figure 18. The result of this trend analysis is frequently expressed as an equation.

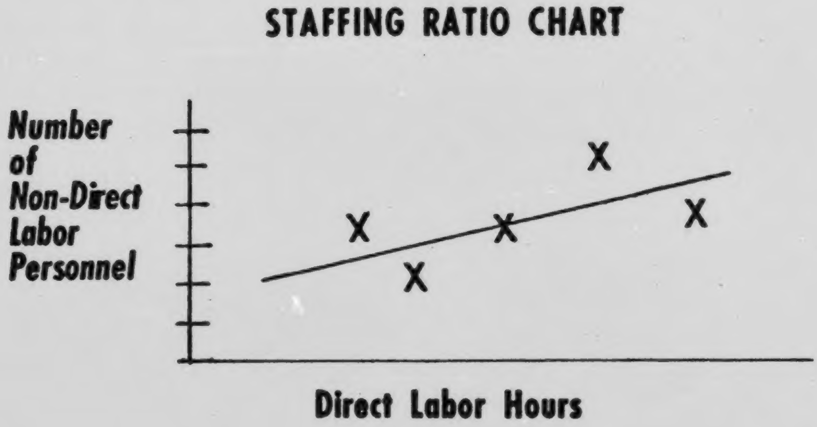

Figure 18

While these indicators are not always considered work measurement standards, they have proven valuable for budget formulation, manpower planning and staffing purposes when formally developed by trained measurement specialists.

18. I notice you said "formally developed by trained measurement specialists," you must have something to tell me.

Right! Staffing ratios and trend charts are usually developed by staff personnel responsible for the budget and manpower planning process. The techniques used are usually informal and based on judgment and simple statistical analysis of historical data.

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19. Anything wrong with this?

The problem lies in the fact that any past inefficiencies of operation tend to be accepted and built into the staffing ratio when they are developed by someone sitting at a desk.

20. It may not be the best, but what other way is there?

The development of such ratios can be developed by personnel who actually visit the work site. For example, one of the defense organizations utilizes specially trained measurement specialists who travel throughout the country to conduct in-depth studies on location. A wide variety of non-direct functions are studied at both field and headquarters level organizational elements using a variety of work measurement techniques, including techniques for developing engineered standards. Functions studied include personnel, equipment maintenance, accounting and finance, legal and safety. The study results are documented as staffing ratios (often in the form of equations, charts and graphs) and are actively used for budgeting and manpower planning purposes. These formally developed staffing ratios replace staffing ratios similar to those currently in use by the other organizations surveyed. Their ten-year experience with these high quality staffing ratios have provided numerous dollar and manpower savings as well as other less tangible benefits. Benefit/cost ratios have proven to be very favorable.

21. Is it necessary to have special traveling teams do this?

Absolutely not. Personnel from a work measurement organization can perform this function under the guidance provided by agency or organization headquarters level. If you don't have separate work measurement organizations, local personnel can be trained.

## D. WORK MEASUREMENT TECHNIQUES

(22.) Several times you've talked about work measurement techniques. Briefly, what are they?

A wide variety of work measurement techniques are used throughout the Federal government. These include time study, work sampling, standard data, historical estimates, and technical estimates. Appendix III provides detailed information on many of these techniques, if you're interested. Standard setting techniques are frequently classified according to the type of standard resulting from their application: engineered or non-engineered.

(23.) Give me a quick and dirty run-down on each!

An engineered standard is a "should take" time to perform a task or operation. They are developed by specially trained analysts and include documentation of the:

- Method or procedure used when the standard was developed.
- Observed or synthesized time values used in determining the final standard time.
- Computations used to establish statistical reliability.
- Rating or leveling observed during performance.
- Allowances used in computation of standard.
- Computations made in developing standard.

Techniques used to develop engineered standards include time study, work sampling, standard data, and predetermined time systems (e.g., Methods Time Measurement (MTM) and General Purpose Data (GPD)).

Non-engineered standards are also an expression of the time required to perform a task or operation. One commonly used technique, historical estimates, uses past performance data which relates manhour inputs with work unit outputs to compute a "should take" time. Techniques used to develop historical standards include averages of actual past experience, modified past experience and various other statistical methods. Another technique used to develop non-engineered standards is technical estimating. This involves breaking a task into components and then estimating times for the accomplishment of each component.

Engineered standards are generally considered to be of higher quality (more accurate) than non-engineered standards. They are usually considerably more expensive to develop and more difficult to keep up to date than are non-engineered standards.

(24.) Then why shouldn't I just use historical estimates?

Historical estimates, the most widely used technique for developing non-engineered standards, are based on the "did take" time of past experience. You run the risk of prolonging inefficient operations, unless an audit of methods and procedures is conducted periodically. This audit should be conducted by trained analysts under the guidance provided by the agency headquarters level work measurement staff discussed earlier.

Engineered standards are based on the "should take" time developed after careful analysis of a task. Actual experience indicates that application of engineered standards is cost beneficial for high volume activities utilizing a detailed close control scheduling system or for developing systems of standard data. Where these conditions do not exist, however, one should not hesitate to use non-engineered standards.

(25.) I believe you said earlier that it is not advisable to just pick one measurement technique and run with it. Am I correct in this?

Absolutely correct! It is not advisable to use the "screwdriver" approach; that is, pick one technique and try to apply it across the board. This has been a common mistake in the past and has contributed to the failure of work measurement systems.

A more productive approach, that is inherent in the systems design approach discussed earlier, is to use a "problem solving" approach.

(26.) How does that work with work measurement?

Determine the desired quality of standard needed. This may vary between functions (e.g., budgeting and work planning and control), organizational element, and workload characteristics (e.g., high or low volume). Then select an appropriate measurement technique. It's something like the professional golfer who picks a club based on the needs of the situation. He doesn't say one club is better than another. Likewise, it is incorrect to say that one work measurement technique is inherently better than another. Of course, one technique may be better than another to solve a measurement problem in a particular situation. Even if it is determined that most standards should be historical, it is quite possible that it would pay to develop an engineered standard for a few big volume tasks where it was desired to make a careful study of the methods or procedures.

㉗ I can argue with you on this.

Before leaving this subject I'd like to make two points about standard data.

㉘ Shoot!

As you may know, standard data is used to develop standards by synthesizing the basic elements of a task and then adding previously established time values of each element to arrive at a task time. Let me give you a simple example of a standard data application.

A carpenter is tasked to hang a 2'-8" x 6'-8" door in a previously framed and cased opening. The standard might be computed as follows from standard data.

| | Operation | Standard Data Time |
|---|---|---|
| 1. | Plan job: receive job order and sequence with other jobs | .25 (hours) |
| 2. | Secure required materials: obtain required door, fasteners, screws, other needed materials and tools | .50 (hours) |
| 3. | Travel to and from work site (1 mile) | .30 (hours) |
| 4. | Install exterior door, hydraulic door check and mortise lock | 3.00 (hours) |
| | Task Standard | 4.05 Hours |

The development of quality standard data is a very expensive process. The development of standards from standard data is a very inexpensive process. Where work tasks are common to a wide variety of organizations or functional areas (e.g., inspection, clerical, and facilities maintenance), it may be feasible and economical to develop engineered based standard data for either direct or non-direct labor.

29. I'm surprised that you include non-direct labor. I thought staffing ratios developed by trained measurement specialists was the big thing here!

Remember, the golf bag. Staffing ratios represent only one of the clubs we carry.

30. But the work is usually so variable and unpredicable.

In many situations it is. That's why you need trained measurement analysts and highly qualified and experienced personnel to manage your work measurement systems. They can properly analyze a measurement problem and determine which "club" or technique to use.

However, there are situations where it pays to develop and use standard data. For example, one defense organization has developed a very extensive system of engineered standard data for facilities maintenance, a non-direct labor area. Facilities maintenance includes the repair and minor construction work normally associated with maintaining buildings and keeping general purpose facilities in operating condition. The common craft skills (e.g., electrician, carpenter, plumbers, and masons) are covered by the standard data. Work measurement standards for individual jobs or tasks which are seldom repetitive, have proven to be very inexpensive to develop and are readily used for detailed planning and control by operating level supervisors and staff.

Despite a cost of 14 million dollars to develop this system, the high initial cost has been offset by the very wide application that has been made in many different organizations. Industry and other government agencies have also adopted this standard data system for their organizations.

In the direct labor areas, many defense and civilian organizations actively pursue the development and use of standard data. Experience within the Department of Defense has shown that standard data can be most effectively developed when a centralized coordinating function is used to:

- Provide general policy guidelines for developing systems of standard data.
- Coordinate standard data development efforts to avoid duplication of effort.
- Disseminate information on standard data systems.

The agency headquarters level work measurement staff should provide this function.

## E. HIERARCHY OF WORK UNITS

(31.) What's the next subject?

The next two issues I'd like to discuss are essential to a successful work measurement system. These are the Hierarchy of Work Units and Work Measurement Accounting.

(32.) A hierarchy of work units! That sounds complicated and mysterious.

It isn't the easiest thing to explain. Yet a hierarchy is one of the keys to developing high quality work measurement standards both economically and practically.

The concept of a work unit is an integral part of a work measurement standard. A work unit is a quantitative measure of work accomplished. A work measurement standard is an expression of the time required to accomplish this work unit.

Most work measurement systems find it necessary to use several levels of work units, each higher level being some form of aggregation of a lower level unit. Figure 19 illustrates a typical hierarchy of work unit levels and their relationship to organizational levels. Figure 20 illustrates the use of work units at each level and Figure 21 is an example of a representative hierarchy of work units for a program.

# INTERFACE of HIERARCHY of WORK UNIT LEVELS and ORGANIZATION

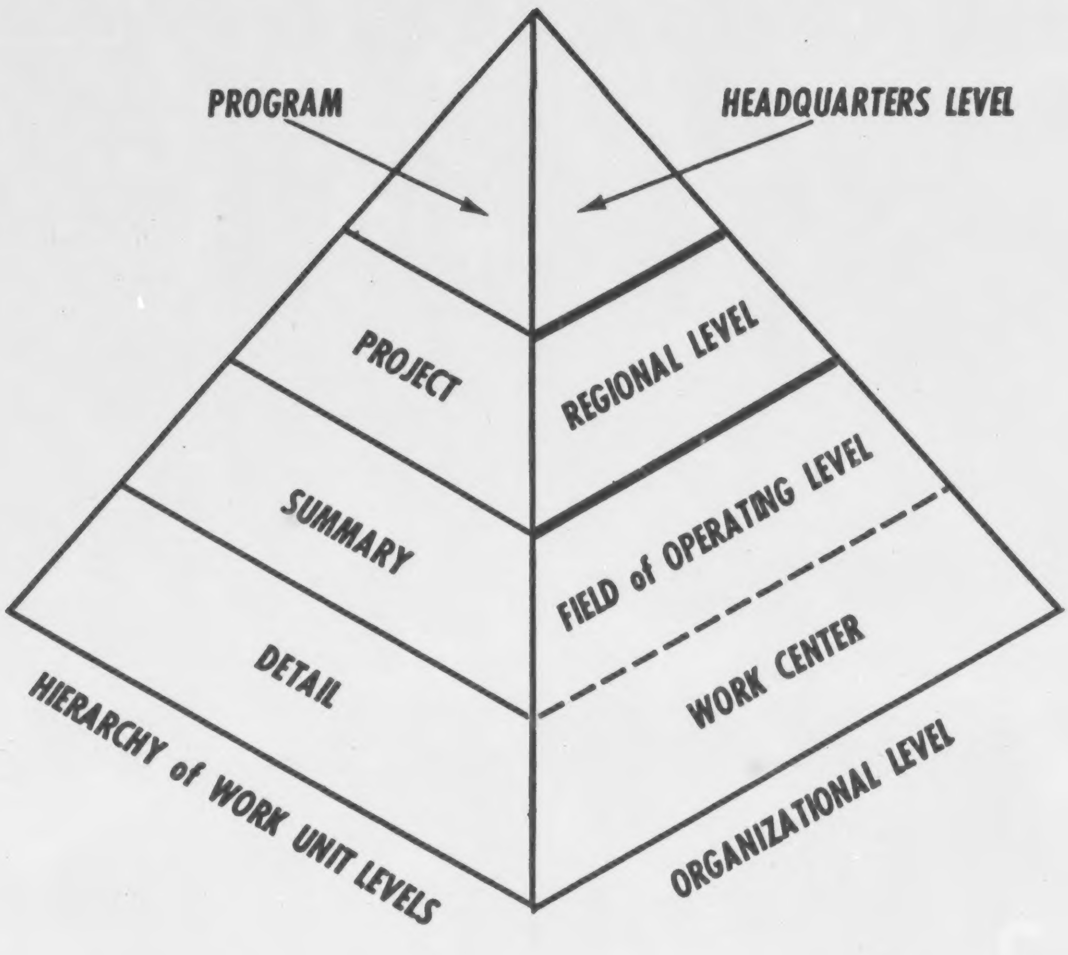

PROGRAM
HEADQUARTERS LEVEL
PROJECT
REGIONAL LEVEL
SUMMARY
FIELD of OPERATING LEVEL
DETAIL
WORK CENTER
HIERARCHY of WORK UNIT LEVELS
ORGANIZATIONAL LEVEL

Figure 19

(33.) Please explain a little more.

Let's look at Figure 20. You will notice that there are two levels of work units at the field or operating level, detail and summary. The detailed work units are selected to support detailed scheduling and performance evaluation at the work center level. A standard is developed for each work unit using one of the available work measurement techniques. The summary work units are selected to support budgeting,

# USE of HIERARCHY of WORK UNITS

| WORK UNIT LEVEL | APPLICATION |
|---|---|
| PROGRAM | ● Budget Formulation<br>● Resource Allocation<br>● Performance Evaluation |
| PROJECT | ● Budget Formulation<br>● Resource Allocation<br>● Performance Evaluation |
| SUMMARY | ● Budget Input<br>● Workload Planning<br>● Resource Planning<br>● Performance Evaluation |
| DETAIL | ● Detailed Planning and Scheduling<br>● Performance Evaluation |

**ORGANIZATION**

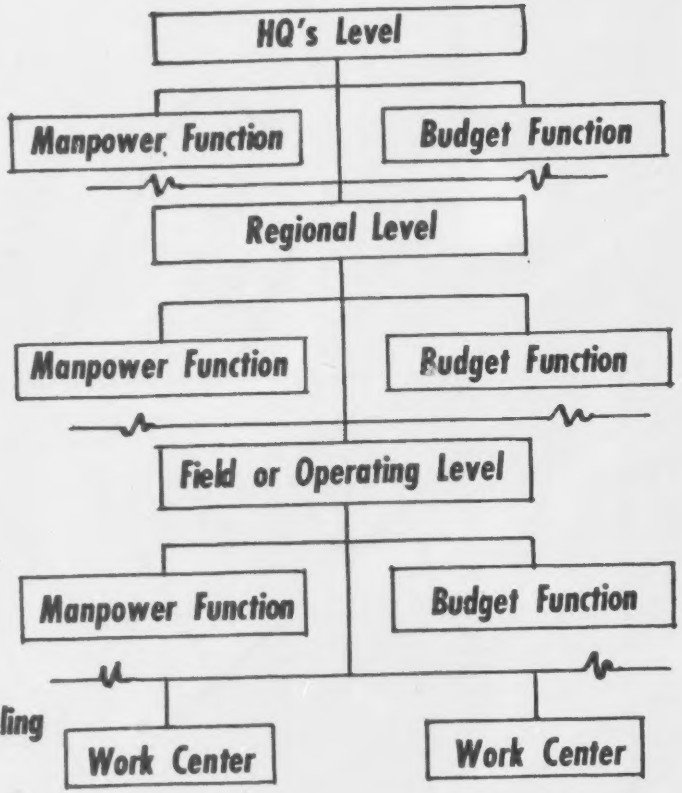
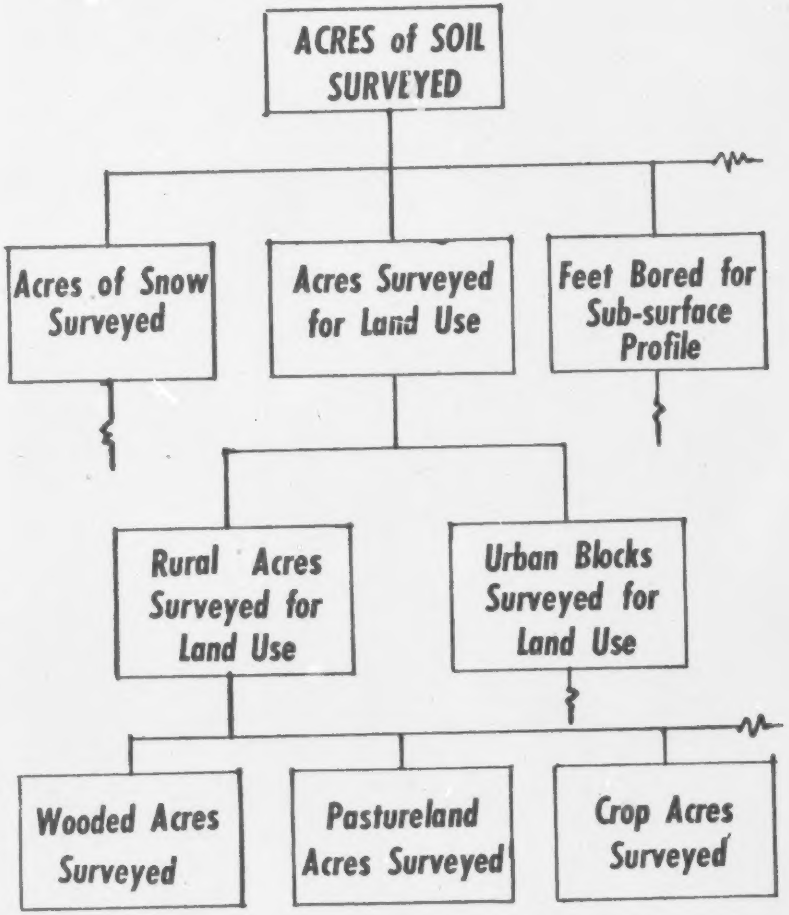

HQ's Level
Manpower Function
Budget Function
Regional Level
Manpower Function
Budget Function
Field or Operating Level
Manpower Function
Budget Function
Work Center
Work Center

Figure 20

# HIERARCHY of WORK UNITS EXAMPLE

**HIERARCHY of WORK UNITS**


ACRES of SOIL SURVEYED
Acres of Snow Surveyed
Acres Surveyed for Land Use
Feet Bored for Sub-surface Profile
Rural Acres Surveyed for Land Use
Urban Blocks Surveyed for Land Use
Wooded Acres Surveyed
Pastureland Acres Surveyed
Crop Acres Surveyed

| WORK UNIT LEVEL | ORGANIZATION LEVEL |
|---|---|
| PROGRAM<br>● Soil Surveys<br>● Others | HEADQUARTERS |
| PROJECT<br>● Snow Surveys<br>● Land Use Surveys<br>● Sub-surface Profiles<br>● Others | REGIONAL<br>(State) |
| SUMMARY | FIELD OFFICE<br>(Country) |
| DETAIL | WORK CENTER<br>(Team) |

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Figure 21

workload planning, resource planning, performance evaluation, or any other managerial function requiring a summary level standard. A standard is developed for each work unit. Usually these standards are based on aggregations of actual or standard earned hours.

Work units are also selected considering management requirements at the regional and headquarters levels. The standards for these levels of work units are used to support budgeting, resource allocation, and performance evaluation, and again, are aggregations of lower level standards.

34. Am I correct in assuming that there are several work units at each level?

Yes sir. In general, there will be many, perhaps thousands of work units at the detail level with progressively fewer at succeedingly higher levels. At the program or project level, there are usually only a few, sometimes only one or two, and--the higher level work units can often be used to integrate the efficiency and performance measurements that we talked about earlier.

35. Very interesting. Now, how can the standards be developed so that each level of the hierarchy is related? I assume that this is what is desired.

Correct! And a "top-down" approach to the design of work unit levels is necessarily compatible with a common accounting structure and the needs of management for each organizational level.

In most instances, detail level standards cannot be aggregated to produce higher level standards because of problems associated with the frequency of occurrence of lower level work units. The most practical way is to mathematically aggregate man-hours from one level to the next which are then used to develop a higher level standard. Either actual or earned hours may be used.

36. A simple example would help.

I'll try. Let's look at Figure 22.. This Work Flow Process Chart illustrates the steps followed in processing legal disputes by an organization. Completion of any of the steps could possibly result in termination of the dispute. When this occurs, the case is considered closed.

## WORKFLOW PROCESS CHART

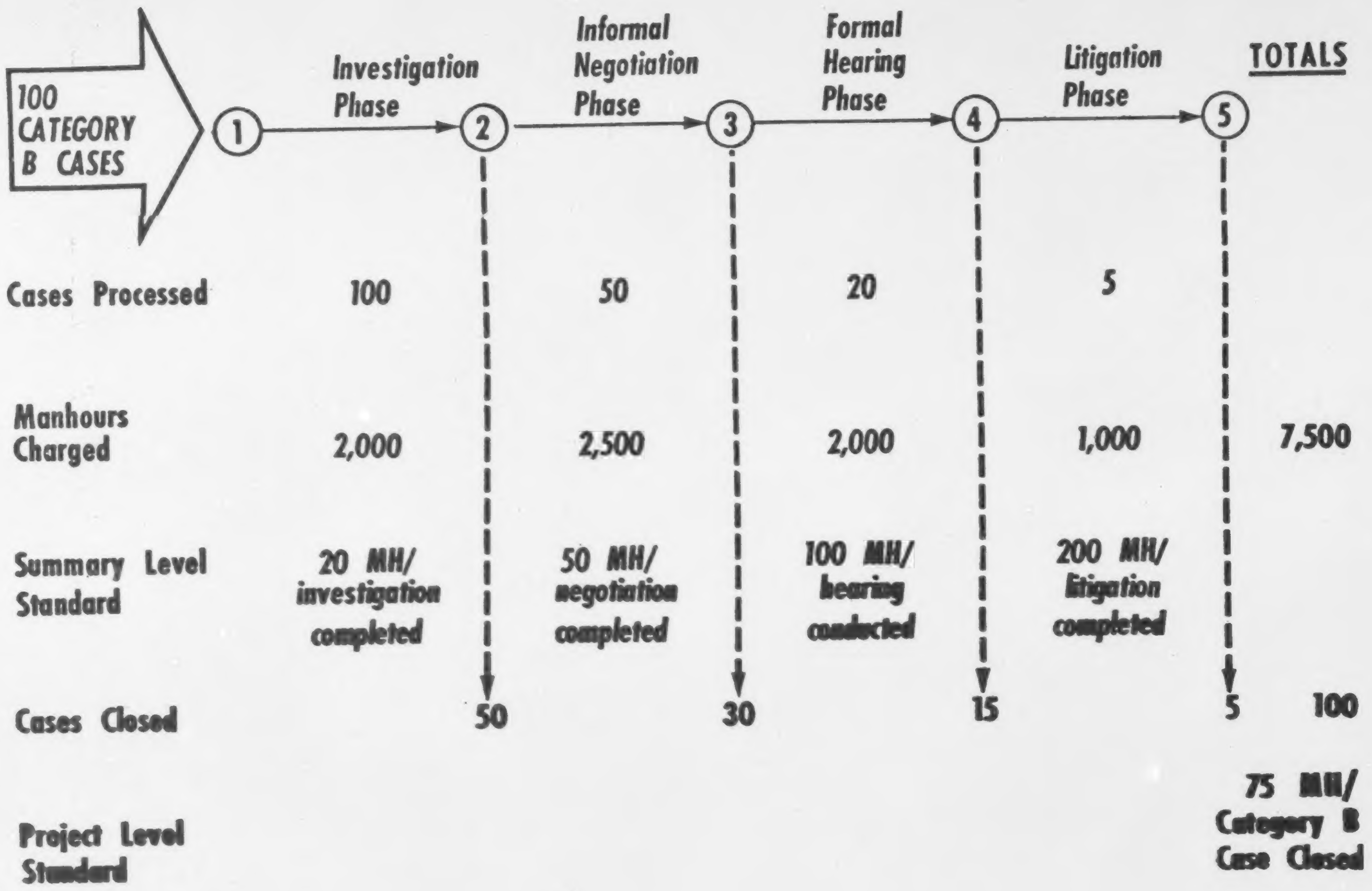
100 CATEGORY B CASES
1
Investigation Phase
2
Informal Negotiation Phase
3
Formal Hearing Phase
4
Litigation Phase
5
TOTALS
Cases Processed
100
50
20
5
Manhours Charged
2,000
2,500
2,000
1,000
7,500
Summary Level Standard
20 MH/ investigation completed
50 MH/ negotiation completed
100 MH/ hearing conducted
200 MH/ litigation completed
Cases Closed
50
30
15
5
100
Project Level Standard
75 MH/ Category B Case Closed

Figure 22

For each process, the number of cases processed through that step and the total man-hours expended is recorded. For example, 50 cases were processed through "Informal Negotiations" at a cost of 2,500 man-hours. Since 30 cases were closed, only 20 went to "Formal Hearings." The summary level historical standards are computed as follows:

$$\frac{2500 \text{ Hours}}{50 \text{ Cases}} = 50 \text{ Hours/Case}$$

Similar computations are made for each of the other summary level work units.

The summary level standard is computed by merely adding the total man-hours for each summary level work unit and dividing by the total number of cases closed.

$$\frac{7500 \text{ Hours}}{100 \text{ Cases}} = 75 \text{ Hours/Case}$$

Figure 23 illustrates the resultant Hierarchy of Work Units and Related Standards.

This concept of summarization of actual hours to develop higher level standards can be carried to any level desired, provided you have man-hour and work unit accounting structures to collect and aggregate the raw data. Many work measurement systems in use today can do this and can also compute updated standards. This is important because higher level standards are actually a weighted average. They must be recomputed when the workload mix changes if they are to remain valid.

㊲. Is this same method used if engineered standards are developed?

That is a very good question. Engineered standards can only be developed at the detail level of work units in most instances. As described above, higher level standards could be developed using aggregations of actual hours. However, a better method is to aggregate the "earned" hours so that a "should take" time can also be developed. Comparison of the "should take" time with "did take" time developed using actual hours points out to higher level managers, areas where efforts to improve productivity should be concentrated. This concept is currently in use in some organizations and has proven to be very useful at all levels of management.

# HIERARCHY of WORK UNITS and RELATED STANDARDS

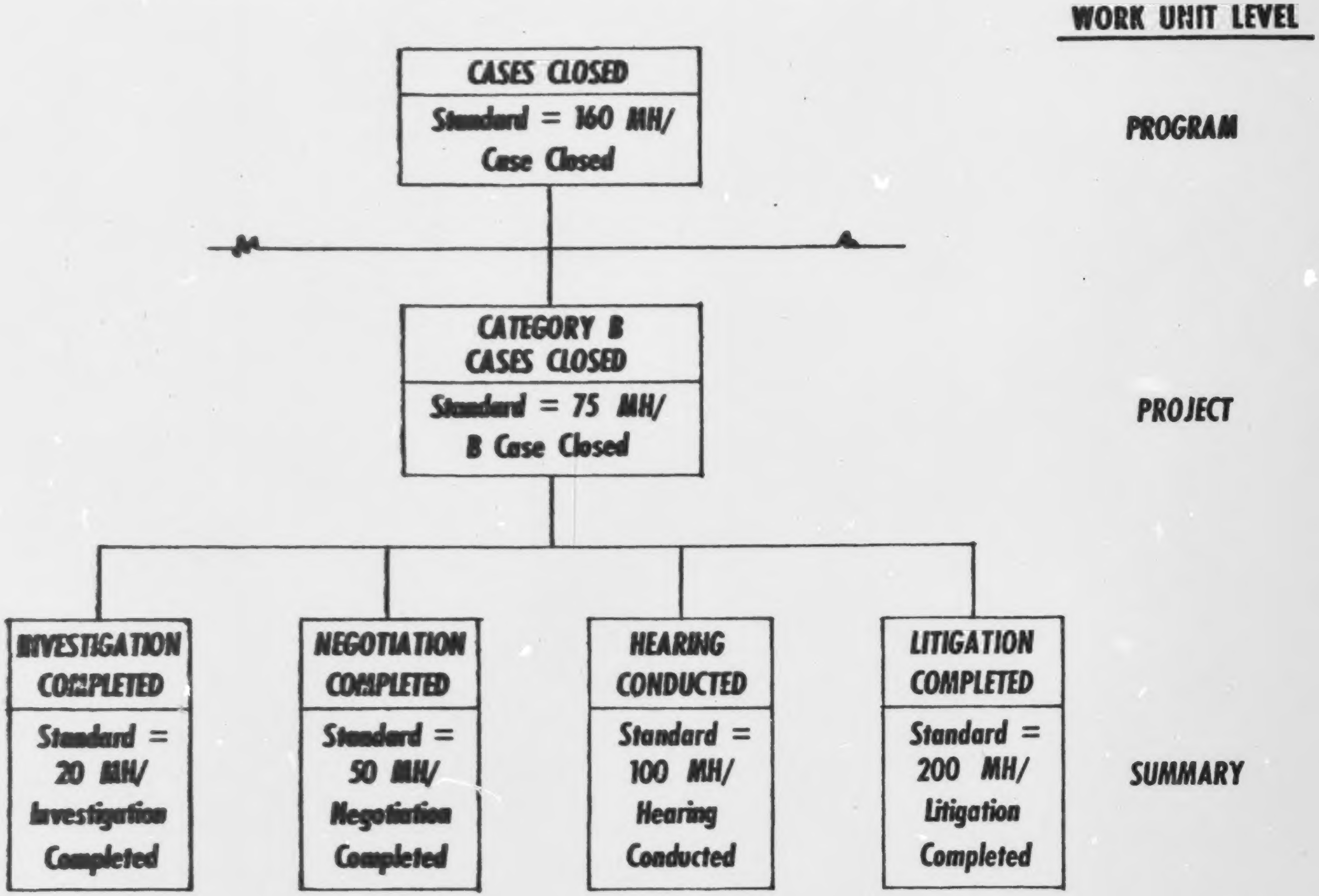
WORK UNIT LEVEL
CASES CLOSED
Standard = 160 MH/ Case Closed
PROGRAM
CATEGORY B CASES CLOSED
Standard = 75 MH/ B Case Closed
PROJECT
INVESTIGATION COMPLETED
Standard = 20 MH/ Investigation Completed
NEGOTIATION COMPLETED
Standard = 50 MH/ Negotiation Completed
HEARING CONDUCTED
Standard = 100 MH/ Hearing Conducted
LITIGATION COMPLETED
Standard = 200 MH/ Litigation Completed
SUMMARY

Figure 23

Let me summarize by stating that all work measurement systems should be based on the hierarchy of work units concept with the:

- Work unit levels designed using a top-down approach.
- Work units integrated into the organization's accounting systems.
- Work units selected to support budget, manpower, and workload planning and control process at all levels of management.

Also, work unit standards above the detail level are best developed by aggregating actual or earned hours rather than detailed standard times themselves.

## F. WORK MEASUREMENT ACCOUNTING

(38.) This seems like a good time to discuss work measurement accounting. Does this mean I need another accounting system?

This is exactly what you probably do not need or want! However, many of the benefits from a work measurement system are dependent on the collection of data on actual performance. This data includes the man-hours expended and work counts for each work unit that has been covered by a standard. These and other data are then integrated and processed to produce needed management reports for each functional area.

In most organizations, accounting systems to support a wide variety of management needs (e.g., payroll, costing, and workload performance) are already in operation when work measurement is introduced. A work measurement system has its own unique requirements in addition to those common to many existing accounting systems. Thus, it is important to integrate the accounting requirements for a work measurement system with those of other systems. All too often, this is a difficult task. However, failure to do so will seriously limit the creation of reports based on work measurement standards that are useful to managers in the functions of budgeting, manpower, and workload planning and control.

③⑨ Do most organizations integrate their work measurement accounting requirements into existing accounting systems?

They try to, although some rather major modifications to existing accounting systems may be necessary. A simplified illustration of an integrated accounting system is illustrated in Figure 24. The payroll accounting system collects all data required for payment of salaries. It also collects data on man-hour expenditures by work unit, thus serving a dual role. The progress reporting system collects data on the number of work units accomplished and the number of certain pre-specified actions taken by the public in response to the services provided by the organization. These actions represent the effectiveness in accomplishing the organization's mission. Data collected under this progress reporting system is correlated to data collected under the payroll system in a computer through the use of common program charge numbers. The data collected under these integrated systems is stored in a common data base and then processed in the computer. The computer outputs are a wide variety of products including those required for payroll and reports on efficiency and effectiveness by both organization and hierarchy of work unit elements.

④⓪ How do you know where measurement accounting begins and ends under such a system?

Often you don't. Typically the accounting is so highly integrated that it is very difficult to separate out the work measurement accounting data. But many work measurement systems owe much of their success to the use of integrated accounting concepts.

④① Just what happens if integrated accounting for work measurement is not employed?

Several undesirable things are likely to occur.

- Data collection and processing costs rise because a separate system is necessary for work measurement.
- It may be much more difficult to compute higher level work unit standards.
- Performance efficiencies for higher level work units may be impossible to determine.

# CONCEPT of INTEGRATED ACCOUNTING

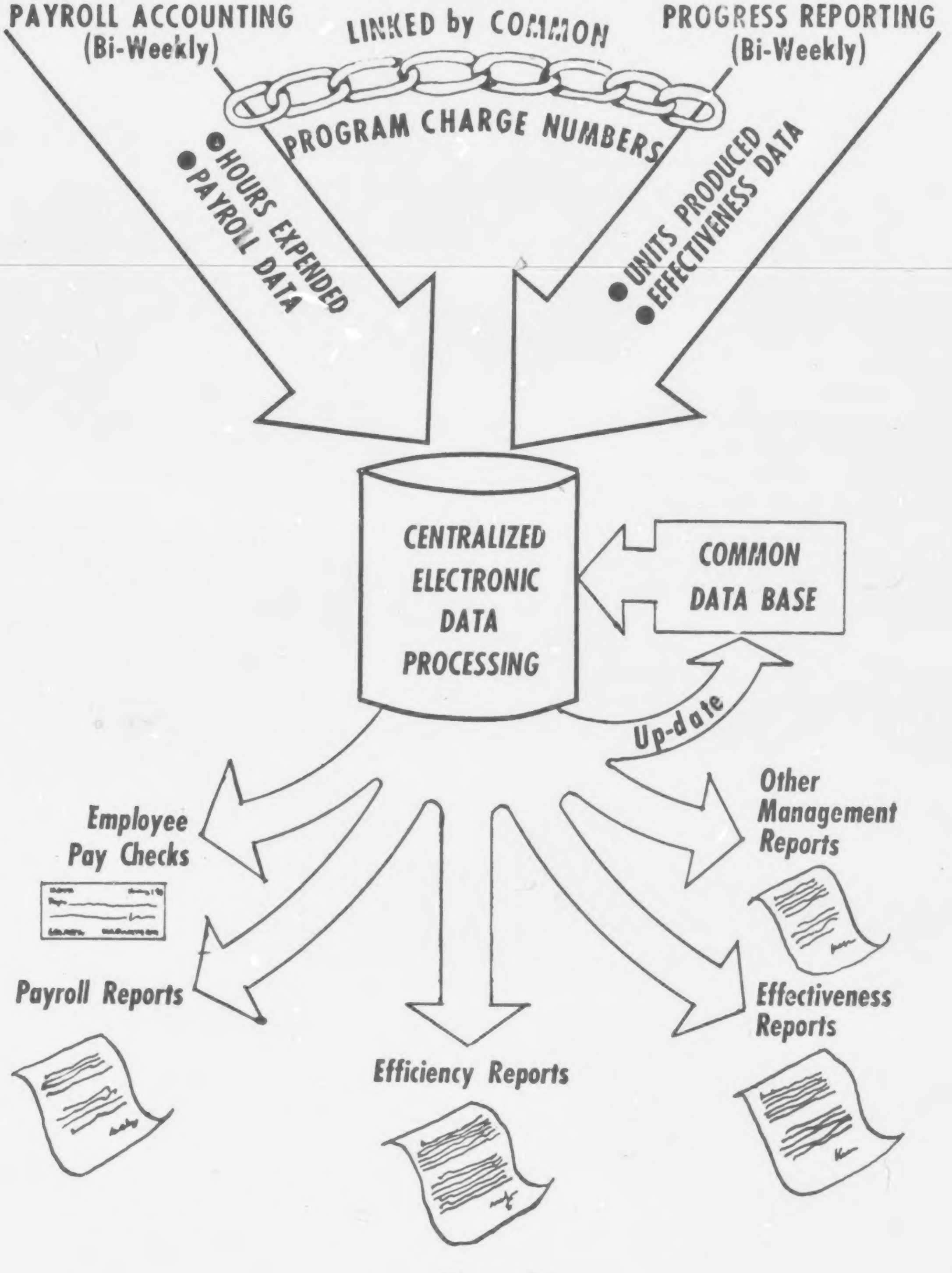
PAYROLL ACCOUNTING
(Bi-Weekly)
LINKED by COMMON
PROGRAM CHARGE NUMBERS
PROGRESS REPORTING
(Bi-Weekly)
● HOURS EXPENDED
● PAYROLL DATA
● UNITS PRODUCED
● EFFECTIVENESS DATA
CENTRALIZED ELECTRONIC DATA PROCESSING
COMMON DATA BASE
Up-date
Employee Pay Checks
Payroll Reports
Efficiency Reports
Other Management Reports
Effectiveness Reports

Figure 24

- An audit trail from detailed to higher level work unit standards may not exist.

It gets quite technical.

42. I believe that! Anyway, I should insist that work measurement accounting be integrated with other accounting systems, right?

Right. Let me summarize the characteristics that you should look for in a properly integrated accounting system that includes work measurement.

- An accounting structure that allows systematic and progressive summarization of data from the work center level to all organization and hierarchy of work unit levels. This will assure traceability of planning activities, performance reporting, and analysis of operating results by both hierarchy of work units and organization. Figure 25 illustrates this concept.
- A flexible accounting system that can accommodate frequent changes in the work measurement standards and work units selected for use in the hierarchy of work units.
- Development and use of uniform and integrated accounting code structures throughout the entire organization. Efficient computer processing requires this uniformity.
- Establishment of a common data base to store all the inputs needed for processing management reports.

The Integrated Resources Management System described in Appendix IV is an example of a currently operating system which is based on a hierarchy of work units and integrated accounting for work measurement.

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# WORK MEASUREMENT DATA ACCUMULATION

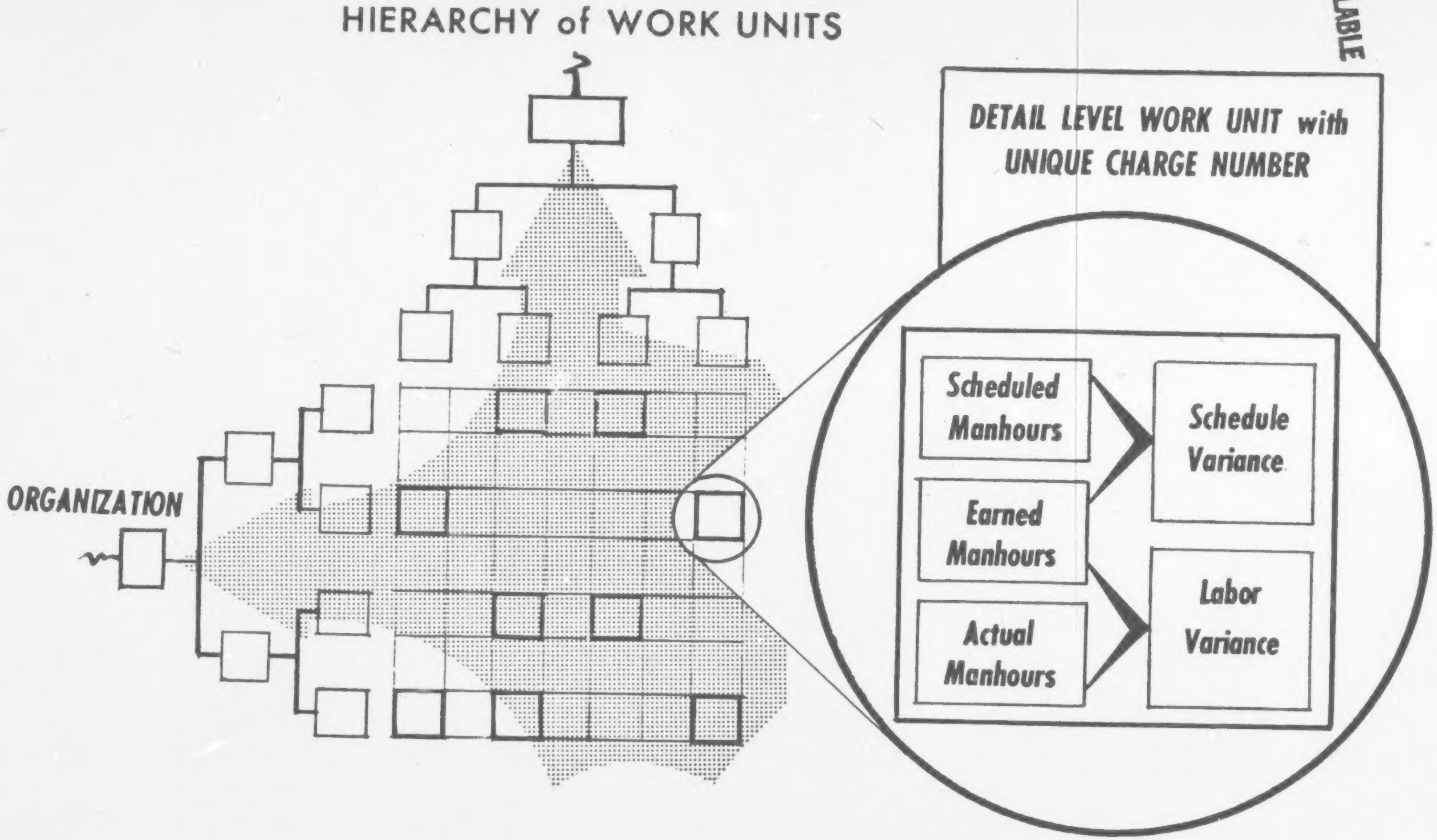
HIERARCHY of WORK UNITS
ORGANIZATION
DETAIL LEVEL WORK UNIT with UNIQUE CHARGE NUMBER
Scheduled Manhours
Earned Manhours
Actual Manhours
Schedule Variance
Labor Variance

Figure 25

## G. INTEGRATING METHODS AND WORK MEASUREMENT

(43.) Let's try something a little less complicated. This hierarchy of work units and integrated work measurement accounting business--I never realized work measurement could get so involved.

Work measurement must get involved or integrated into the basic functions of an organization if it is to be effective. The only way to accomplish this is to use integrated accounting and a hierarchy of work units.

We will discuss some less technical issues now. The first will be the integration of methods and work measurement. There are two common points of view concerning this relationship. These are

- Methods study analyzes alternative methods, while work measurement is merely placing a time value on the use of a specified method.
- Methods study is one step, but a very important one, in the development of a work measurement standard.

Most government organizations relying exclusively on historical standards have adopted the former point of view. Separate organizations are responsible for methods or procedures study and the development of standards. This arrangement suffers if management does not place proper emphasis on methods and standards activity. Experience has shown that when these two activities are fragmented, methods and procedures work often does not get the attention it deserves. Standards are established because the users must have them for budget, manpower, or gross workload planning purposes. Methods and procedures improvement studies are put off or forgotten because they are not essential to getting the job done. The end result is a failure to capitalize on opportunities to increase productivity.

(44.) Are you saying methods and work measurement should be combined in one organization?

Not necessarily. I am suggesting that management take whatever steps are necessary to assure that methods or procedures studies are properly emphasized. Setting standards and methods work is combined in many organizations, particularly if engineered standards are utilized. However, a different problem is encountered under this arrangement.

(45.) Nothing is ever easy, is it?

I'm afraid not. In organizations using engineered standards, the problem is one of maintaining a proper balance between conducting methods or procedures studies and the setting of standards. If too much emphasis is placed on achieving some standards coverage goal, particularly engineered standards, then methods and procedures work suffers. And the converse can also be true. Standards may suffer a deterioration in quality, and the users of standards complain. Striking a proper balance is a continual problem in most organizations using engineered standards.

(46.) It sounds as though the analysts involved in work measurement activities have a productivity problem like everyone else!

They certainly do. They need to increase their productivity as much as anyone else. I'll have a few things to say about this later.

(47.) Fine. But right now, you've presented a problem. The balancing of work measurement or the setting of standards versus making methods and procedures studies. Just how does one go about doing this?

There is no precise answer. One way to do it is to analyze the workload to determine which units of output consume the greatest amount of manpower. Next, you would determine where and how to apply methods and procedures studies and standards setting activities. You would vary the level of effort roughly in proportion to the quantity of resources consumed by various elements of the workload.

One organization has developed a formalized method for doing this. Periodically, the workload is analyzed to determine which units of output, or workload groups, consume the greatest manpower. Typical results of such a workload analysis are shown in Table 3.

## TABLE 3

## WORKLOAD ANALYSIS PROFILE

| Workload Group | % Total Items | % Total Direct Labor Manhours |
|---|---|---|
| A | 10 | 80 |
| B | 22 | 17 |
| C | 68 | 3 |

From the table, it will be noted that 10% of the workload consumes 80% of total direct manhours expended by the organization. (Workload distributions similar to this are found in many organizations.)

The results from this type of analysis provide the management in this organization a basis for determining:

- o Areas for concentration of methods study or procedures analysis.
- o Most appropriate work measurement techniques to employ.
- o Intensity of workload planning and control needed.

Table 4 typifies this concept as currently utilized in one organization. Gross standards are established for all workloads at the time they are received by the organization. Methods studies and final work measurement follow later as appropriate. Although most managers employ this concept intuitively, few

# WORK MEASUREMENT/METHODS STUDY

# APPLICATION PLAN

| Phases of Work Measurement Activities | WORK UNIT GROUP AND % TOTAL MANHOURS | | |
|---|---|---|---|
| | A = 80% | B = 17% | C = 3% |
| Initial Work Measurement | ← Gross Standards Coverage → | | |
| Methods Studies | Intensive | Cursory Review | None |
| Final Work Measurement | Engineered | Non-Engineered | Retain Gross Standards |
| Workload Planning and Control | Detailed | Moderate | Gross |

TABLE 4

organizations formally establish this concept as an organization policy.

(48.) To wrap up this discussion in a few words, what basic procedure should I follow in implementing both methods and procedures studies and work measurement standard setting activities in my organization?

Generally, the initial emphasis should be directed toward establishing a high coverage of personnel with gross work measurement standards. These may be historical standards for direct labor, and staffing ratios for non-direct labor. This should be followed with a strong emphasis on methods studies and procedures analyses in direct and indirect labor areas, consuming the majority of labor dollars expended. Engineered or revised non-engineered standards should then be developed if it is determined to be beneficial in all areas.

## H. QUALITY WORK MEASUREMENT STANDARDS

(49.) What's next?

An important issue with the users of standards is quality. But before we get into this subject, I think it would be advisable to define two terms that represent the two components of quality: reliability, or accuracy, and validity.

- Reliability or accuracy pertains to the statistical accuracy of the standard. In other words, is the standard representative of the time needed to accomplish the task?
- Validity pertains to the method on which the standard is based. The standard must reflect the method currently used in performing the task.

Most people do not distinguish between these terms. They use one or the other of these terms, often incorrectly, to express their dissatisfaction with the quality of work measurement standards.

A common complaint about quality voiced by many users of standards is that standards aren't accurate and up-to-date. In particular, there is a general reluctance at higher management levels to use standards developed at lower organizational levels, because of alleged quality problems. Budget analysts and manpower specialists frequently make this complaint.

(50) Some of my budget types are always complaining about this.

This is not unusual. Organizations that have not developed a hierarchy of work units and integrated accounting structures frequently have these complaints. The standards developed at the field or operating levels cannot be meaningfully related to higher level work units, nor can man-hour expenditures and work unit outputs be summarized as a basis for developing higher level standards. Where organizations have developed a hierarchy of work units and integrated accounting systems for use on advanced electronic data processing equipment, problems in maintaining quality of standards for all levels of management are greatly reduced.

(51) Are you telling me that maintaing quality in standards is dependent upon developing a hierarchy of work units, use of an integrated accounting system and the services of a computer?

Those items will go a long way in helping analysts keep standards up to date. As we discussed earlier, the integrated accounting system and hierarchy of work units make it structurally possible to aggregate actual or earned man-hours to any level of work unit desired. The computer makes possible rapid summarizations of other data needed to compute new, or revise old, historical standards, often automatically. Since any standard above the lowest level is a weighted average, there is a need to re-compute standards as the workload mix at the operating or field level changes. Changes in workload mix is usually the rule rather than the exception.

Thus, the work measurement analysts can spend more of their time performing methods or procedures studies and developing the lowest level work measurement standards. Quality of standards (both accuracy and validity) is correspondingly enhanced in systems with the characteristics described above. Consequently, users at all levels have more confidence in the standards and find them more useful.

(52.) The computer can automatically compute many of the standards above the lowest level then!

Correct! Many modern work measurement systems operate in just this manner. The computer is also used as a "quality control" for standards. It can be used to "flag" potentially outdated or invalid standards. For example, in some work measurement systems, standards that are over two years old, are automatically printed out quarterly on a special report. Also, whenever performance against a standard varies by more than ± 20% for three consecutive weeks, the computer "flags" the standard for review.

These computer "quality control" functions are particularly useful when engineered standards are in use. These standards are employed when close scheduling is used and accuracy and validity in the standard is much more critical to successful operations.

(53.) The computer can't do it all. I still need analysts.

Right. The quality in standards needed for a successful work measurement system is dependent upon adequate staffing with qualified and properly trained analysts.

## I. STAFFING OF WORK MEASUREMENT

(54.) So far, little has been said about the staffing required for work measurement. What are a few pointers on this? It sounds to me as though work measurement systems require highly experienced and trained people to accomplish the job.

You are quite correct in this assumption. Let's start with the agency headquarters level work measurement staff. As we discussed earlier (Question 5, pg. 51), this staff element "sets the pace" for much of the work measurement activity throughout the agency. It is essential that they be highly experienced and trained. They should thoroughly understand the management processes for budget, manpower, and workload planning control, and how work measurement can support these processes.

55. I happen to be at a headquarters level below the agency headquarters. What kind of staffing do I need?

If your organization is large and subdivided into several large organizational units that operate autonomously, you may need a small work measurement staff to function in a manner similar to that at the agency headquarters level. If your organization is small or tightly controlled by the headquarters level, you may not need a separate staff. In any case, you should take an active role in formulating basic policy on work measurement.

56. Am I correct in assuming you mean a staff not actually involved in establishing work measurement standards?

Yes. Responsibility for establishing work measurement standards is the next subject I wanted to bring up.

57. Where's the best place to assign responsibility for establishing work measurement standards?

There is no "one best way" to assign responsibility for establishing work measurement standards. Determination of where to assign the work measurement function is dependent upon the type of work performed by the organization.

58. I was afraid you would say that! That's not very helpful.

Most organizations relying exclusively on non-engineered standards assign this responsibility to the staff people who use them. For example, the budget analysts develop the standards used by them. On the other hand, many organizations using engineered standards have separate organizations, often assigned at the operating or field level, that devote full time to conducting methods or procedures studies and establishing work measurement standards. Most of these organizations:

- Utilize detailed workload planning and control systems that require detailed work units.
- Produce a wide variety of outputs, often in considerable volume.

- Require frequent changes in methods and procedures.
- Require "customized" standards peculiar to their organizations.
- Utilize technical experts especially trained in work measurement techniques.

59. Does this mean that responsibility for establishing historical standards should be assigned to functional users and that engineered standards should be assigned to separate organizations at the operating level?

I was afraid you would say that! As I stated previously, there is no "one best way". Some organizations use headquarters level teams to establish engineered standards at the operating level. It all depends upon the circumstances. I only cited what is the prevailing practice in several successful work measurement systems.

60. How many analysts do I need?

There is no hard and fast rule here either. In those organizations relying exclusively on historical standards where the users are responsible to establish standards, the function is usually combined with budgeting, manpower, or some other activity. The needs of each work measurement system ultimately determined the exact staffing level needed.

In organizations utilizing engineered standards, a higher level of staffing is usually employed. One analyst for every 100 employees covered by engineered standards is used in some organizations as a rough rule of thumb. Some of these same organizations allow one analyst for every 400 employees covered by non-engineered standards. But remember, short term savings achieved through arbitrary reductions in work measurement staffing to levels below that needed to maintain standards and perform methods studies will lead to lower operating efficiency and mission effectiveness in the long run.

## J. TRAINING

61. Work measurement seems to affect a lot of people. Won't I need some training?

Yes, you will.

Technical training is needed by those responsible for developing and applying standards. This includes analysts from work measurement organizations and those dealing with standards in the budget and manpower processes.

Seminars are needed for headquarters level managers and executives, middle managers, field managers, operating level supervisors and key staff personnel. Many of these individuals do not understand the role of work measurement, even though work measurement and other performance measurements have been used for many years in the government.

## (62.) What would these seminars cover?

For top level managers and executives, the following topics would be appropriate.

- Concepts of performance measurement systems.
- Need for increased use of work measurement standards for budget and manpower planning.
- Characteristics commonly found in effective work measurement systems (such as the things we've been talking about).
- Descriptions and characteristics of work measurement systems currently in use.

The use of case studies is a particularily effective method to use in seminars at this level.

For lower level managers, operating level supervisors and key staff personnel, the same topics would be appropriate but should be covered in more detail. Also, consideration could be given to a brief description of the techniques commonly used to establish standards.

## (63.) Where can I get any training I might need for my organization?

Both technical and management training may be obtained from colleges, universities, and management consultants on a contract basis. Training in this area is also available from the U. S. Civil Service Commission and the U. S. Army Management Engineering Training Agency.

64. Couldn't I do some of this training myself?

Yes, several organizations currently do. They use formally prepared briefings for managers that describe their own work measurement systems. Many of them also conduct special courses and use OJT (on-the-job training) for those responsible for developing standards. However, most of them find a combination of internal and external training to be most suitable for their needs.

## K. COST OF WORK MEASUREMENT

65. For what we've talked about, the design, implementation and operation of work measurement systems is expensive. Why the training alone could cost a bundle. What's the whole thing going to cost me?

An estimate of the cost to design, implement, and operate a work measurement system is very difficult to develop. Only the costs for personnel directly assigned to a work measurement organization, and perhaps training costs, can be easily estimated. The other costs are much more difficult if not impossible to determine. For example, the cost of modifying existing accounting and management information systems to allow effective utilization of work measurement standards is usually impossible to isolate. The difficulty arises because successful systems are usually highly integrated and designed to serve a wide variety of management needs for budgeting, performance evaluation, payroll accounting, and production reporting, to name a few. Another cost that is difficult to estimate is the cost of reporting work counts and manhour expenditures. Here the cost is often difficult to isolate because of the integrated nature commonly used in this process. Other costs pose similar problems when attempting to isolate them.

The benefits derived from a work measurement system are even more difficult to measure by quantifying them in terms of dollar savings. However, one benefit that can be isolated in terms of dollars is that for work measurement organizations.

Any effective and efficient work measurement organization should be able to function with a favorable benefit to cost ratio. Typically, these range from 3:1 to 6:1. The work measurement activity should more than pay for itself over the long run, assuming that methods and procedures work are associated with the activity of developing standards. The act of establishing a standard itself can never save any money; savings can only be realized by using the standard.

## L. DISCENTIVES TO WORK MEASUREMENT

(66.) One of the things troubling me is all the disincentives to the use of work measurement. If I use work measurement to develop a more efficient operation, I'm lucky not to get penalized, much less rewarded. Some friends of mine who run fairly efficient operations have lost the same percentage of people during RIF's as those who ran less efficient operations. The same is true when it comes to budget cuts. At times it seems as though the better the job you do, in terms of being efficient, the worse off you are. And you never know what Congress is going to fund. Programs are expanded, contracted, or revised; often in a very unpredicable fashion. Just why should I be so concerned about making my organization more productive?

Self-pride if for no other reason. There are many government managers who are very successful in spite of the disincentives or problems you've mentioned! They view the disincentives as challenges and frequently find work measurement a useful tool in overcoming their problems.

# CHAPTER IV

# MAINTAINING PERFORMANCE IN WORK MEASUREMENT SYSTEMS

Considerable discussion has been devoted to how to establish a work measurement system. Let us now turn our attention to what actions it may be advisable to take once you have an operating system.

① I hope it doesn't require much of my attention.

It shouldn't, provided a good job was done during the design and implementation of your work measurement system. However, it is most important to assure yourself that standards are maintained at acceptable quality levels and that they are properly and effectively used in various management processes.

## A. MANAGEMENT AUDITS

② And what is the easiest and best way to do this?

Many successful work measurement systems use an audit concept. Personnel from a work measurement headquarters level staff periodically conduct on-site reviews wherever standards are developed or being used. Check lists are useful for this purpose to assure comprehensive coverage of those areas included in the review. These visits are also useful in establishing or maintaining closer working relationships between those affected by the work measurement system.

③ What are the major considerations that these audits should include?

Each of the following areas should receive at least some attention. Those marked with an asterisk should probably receive the greatest in depth review during an audit.

- Work Measurement Systems Design
- Organization and Staffing
- Integration of Work Measurement With Other Performance Measurements*
- Coverage of Direct and Non-Direct Labor*
- Application of Techniques
- Hierarchy of Work Units*

- Work Measurement Accounting*
- Methods and Procedures Studies*
- Maintaining Quality of Standards*
- Use of Standards in Budget Processes*
- Use of Standards in Manpower Processes*
- Use of Standards in Workload Planning and Control*

For each area, a checklist should be developed that is tailored to the characteristics of the system to be audited. Tables 5 and 6 illustrate the type of questions which might be developed for two of the areas.

4. I understand this, but what should the audit team be looking for?

This is difficult to state in exact terms. The checklists can only serve as a guide on what to look for. It is largely up to the individual members of the audit team to determine most profitably where they can concentrate their attention. Checklists alone will not do this. Perceptiveness of the individual is crucial to any meaningful audit.

The things to do or look for would include:

- Reviewing the general effectiveness of the work measurement system.
- Assessing the current effectiveness of the work measurement system against its potential.
- Isolating problems by cause, not by symptom.
- Determining whether problems are caused by faulty design of the system or are truly operational problems.
- Developing recommended actions for improvement in system operation.

5. How often should I consider approving audits of the type you describe? This can be expensive and lead to considerable disruption in the organization subject to the audit.

If a work measurement system appears to be functioning relatively smooth; perhaps only once every two or three years.

TABLE 5

## AUDIT CHECK LIST FOR

## USE OF STANDARDS FOR BUDGET PROCESSES

a. Are budget formulations based on use of summary level standards or aggregations of lower level budgets?

b. Is adequate justification provided in support of manpower resource requests to higher authority?

c. Are standards effectively used in the budget allocation process? Does the allocation of manpower resources appear to be in balance with assigned workloads?

d. Do reports on both manpower expenditures and workload accomplishments reach budget personnel on a timely basis?

e. Are workload accomplishments converted to "value earned" before comparisons are made with actual costs? Review the procedures used to compute "value earned".

f. How are cost trends evaluated? Are efficiency measurements systematically applied to measure cost performance? Review procedures in use.

TABLE 6

## AUDIT CHECK LIST FOR METHODS AND PROCEDURES STUDIES

a. Is there tangible evidence in the form of completed studies to indicate that the methods improvement program is being carried out?

b. How many studies have been reported during the last six months? The last year?

c. Is it evident, through the review of work standards documentation files, that methods studies are conducted prior to the establishment of work standards?

d. Do line managers and supervisors indicate support of the methods program?

e. Have savings resulting from methods studies been documented? Are these savings verified by an auditing group separate from the Work Measurement staff? Have cost saving goals been established?

f. Is there a report on savings and/or productivity achievements attributable to the Work Measurement Program efforts circulated throughout the activity?

g. Select several method improvements from the files. Verify them with the supervisors of the organization involved. Are the new methods installed and working? Were the cost figures stated in the proposal realistic?

If there are obvious or serious problems, then more frequently. In any event, they should be conducted frequently enough to assure maintenance of quality standards and the effective use of standards. Mature and successful work measurement systems generally find a diminishing need for frequent and intensive audits.

## B. PERFORMANCE MEASUREMENT

6. Assuming that audits are going to be conducted on a rather infrequent basis, how can I assure myself that I have viable work measurement systems on a continuing basis?

Performance measurements are good for most organizations. There is little reason they should not also be good for a work measurement system.

7. You mean, efficiency and effectiveness measures?

That's right! Both measures are commonly used to assess a work measurement systems performance. These measures are most easily applied to organizations involved in establishing standards. They are also useful to measure the use of standards, but establishing useful measures is much more difficult.

8. What effectiveness measures would be useful?

A very common one is coverage of personnel with standards. Table 7 illustrates a quarterly progress report for this type of effectiveness measurement. Other possible measures, for which performance goals could be established are:

- Percentage of standards not reviewed during the past two years.
- Dollar savings from methods studies per work measurement analyst.
- Percentage of manpower spaces supported by work measurement standard.
- Percentage of budget manhours supported by engineered standards.

## TABLE 7

## COVERAGE GOALS EXPRESSED AS % OF TOTAL MANHOURS

| Type of Measure | Direct Labor | | Non-Direct Labor | |
|---|---|---|---|---|
| | Goal | Actual | Goal | Actual |
| Engineered | 60 | 48 | 0 | 0 |
| Non Engineered | 30 | 37 | 20 | 5 |
| Staffing Ratios | 10 | 5 | 80 | 43 |
| Total Coverage | 100 | 90 | 100 | 48 |

### (9.) Now what about efficiency measurements?

There are two possibilities here. For example, a unit cost measurement frequently used is the cost per hour of standard developed. The planned cost is compared against actual cost on a quarterly basis. Another measure is the dollar cost per dollar of savings from methods studies. For long term measurement, this ratio could be used to compute a productivity index for the work measurement function.

### (10.) What are the best measures to use?

The effectiveness measurements and performance goals should be selected to encourage the type and level of response you desire. As you know, people tend to work toward the goals that management has clearly stated. Specification, quantification, and measurement of the attainment of goals can be used to encourage the type of performance desired.

11. What is the most important thing I should do if I want a successful work measurement system?

Develop and maintain a sustaining interest and support for your work measurement system(s). Specify the operating results you want, in quantifiable terms where possible, and then measure performance against these goals and objectives.

12. Is that all?

That's it! Thank you for your time and interest. It's been a pleasure talking with you.

13. Thank you also.

# APPENDIX I

## GLOSSARY OF TERMS

ACCURACY - see reliability

ACTUAL HOURS - All manhours reported against a charge number and for which labor costs must be applied.

ALLOCATION - An authorization by a designated official of a department making funds available within a prescribed amount to a lower level organization.

APPROPRIATION - A statutory authorization to make payments out of the Treasury for specified purposes.

AVERAGE UNIT COST - Total actual cost divided by the output.

BUDGET - A proposed plan by an organization for a given period of time reflecting anticipated resources and their estimated expenditure in the pursuit of objectives.

BURDEN LABOR - see non-direct labor.

COST ACCOUNTING - The recording and reporting of financial transactions in terms of the cost of goods and services used or otherwise applied in the carrying out of programs and activities during a specified period.

DETAILED LEVEL STANDARD - A standard for a detail level work unit. See hierarchy of work units.

DIRECT LABOR - Personnel whose time is charged against an identifiable product or service that is considered to be a direct mission output of an organization.

EARNED HOURS - The time in standard hours credited to an employee or a work center as a result of the completion of a given task or group of tasks; usually calculated by summing the multiplication of applicable standard time and the completed work units.

EFFECTIVENESS - The performance or output received from an approach to the accomplishment of a mission program.

EFFECTIVENESS MEASUREMENT - Effectiveness measurement compares actual results against some end objective or goal. These goals are used to assess how well an organization is accomplishing its mission programs.

EFFICIENCY - The quality or degree of being productive with the resources employed.

EFFICIENCY MEASUREMENT - Efficiency measurement compares actual performance against some standard of performance to determine how well an organization is utilizing its available resources. It is an "economic" measurement. The three measurements commonly used for this purpose are work measurement, unit cost measurement and productivity measurement.

ENGINEERED STANDARD - The time (man-hours) it should take a a trained worker or a group of trained workers, working at a normal pace, to produce a described unit of work of an acceptable quality according to a specified method under specific working conditions. It is derived from a complete, objective analysis and measurement of the task. They are developed through the use of time study, predetermined time systems, standard time data, work sampling, or any combination of these techniques that will give a comparable level of accuracy.

HIERARCHY OF WORK UNITS - A structure which relates work units at various summary levels to each other and to the work units for each individual task at the operating level required to accomplish a project.

HISTORICAL STANDARD - A standard developed using past performance data relating manhour inputs with work unit outputs as a basis for determining the time required to accomplish a defined amount of work. It is the "did take" time.

GENERAL AND ADMINISTRATIVE LABOR - see non-direct labor.

GROSS LEVEL STANDARD - A standard for a program or project level work unit. See hierarchy of work units.

INDIRECT LABOR - see non-direct labor.

INDEX NUMBER - A magnitude expressed as a percentage of the corresponding magnitude in some "base" period. The base is usually designated as equal to 100.

INDUSTRIAL FUND - A revolving fund established in the Department of Defense for the purpose of providing working capital for the operation of industrial-type or commercial-type activities.

INPUT - The resources (e.g., men, money, and material) utilized by an organization to produce or accomplish an output.

LEVELS OF WORK UNITS - see hierarchy of work units.

MANAGEMENT - It consists of those continuing actions of planning, organizing, directing, coordinating, controlling and evaluating the use of men, money, materials, and facilities to accomplish missions and tasks.

MANHOUR - A unit of measure representing one man working for one hour.

MANPOWER UTILIZATION - The manner in which available personnel are used in an organization in terms of the efficiency in accomplishing the mission and functions.

METHODS STUDY - The technique that subjects each operation of a given piece of work to close analysis in order to eliminate every unnecessary element or operation. It includes the improvement and standardization of methods, equipment, and working conditions.

METHODS-TIME MEASUREMENT - A system of predetermined motion-time standards. It is a procedure which analyzes any operation into certain classifications of human motions required to perform it and assigns to each motion controlled only by the individual performing it a predetermined time standard which is determined by the nature of the motion and the conditions under which it is made. Abbreviated as MTM.

MISSION - A statement of the official activity goals assigned to an activity.

NON-DIRECT LABOR - Personnel whose time is not charged against an identifiable product or service that is considered to be a direct mission output of the organization. It includes Indirect Labor, Overhead Labor, Burden, General and Administrative Labor.

NON-ENGINEERED STANDARD - The time required to produce a unit of work. It is generally considered to be a lower quality than an engineered standard because it is not developed using an engineering approach. Historical estimates and technical estimates are the techniques most commonly used to develop them.

OBJECT CLASS - A Congressional and OMB budgeting term reflecting the nature of things or services purchased regardless of the purpose of the program for which they are used. For example, "personnel services and benefits" and "grants and fixed charges."

OPERATING BUDGET - A budget expressing programs versus object classes of expenditure.

ORGANIZATION - An identifiable unit or group of persons having specific delegated function(s) or mission.

OUTPUT - The products or services an organization produces.

PERFORMANCE BUDGET - A budget expressing program outputs versus classes of expenditure.

PERFORMANCE EFFICIENCY - The ratio between actual and standard performance expressed as a percentage.

PLANNED UNIT COST - Predetermined statements of what costs will be under planned methods of operation.

PLANNING - The selection of courses of action through a systematic consideration of alternatives in order to attain organizational objectives.

PRE-DETERMINED TIME SYSTEM - Proprietary time systems using time data at the basic level that is synthesized into a standard time for a job. Includes Methods-Time-Measurement (MTM) and General Purpose Data (GPD).

PRODUCTIVITY INDEX - A ratio determined by dividing the productivity measurement in question by the productivity measurement for a base period.

PRODUCTIVITY MEASUREMENT - Relates the output units for an organization to one or more associated inputs. This measurement is mainly used at higher management levels as a long term assessment of performance.

PROGRAM - (1) A plan or scheme of action designed for the accomplishment of a definite objective that is specific as to the time-phasing of the work to be done and the means proposed for its accomplishment, particularly in quantitative terms, with respect to manpower, material, and facilities requirements; thus a program provides a basis for budgeting; (2) a budget account classification.

PULL-UP BUDGET - A budget based on aggregations of lower level budgets or information.

PUSH-DOWN BUDGET - A budget developed at a summarized level and then distributed or imposed on lower organizational levels.

QUALITY WORK MEASUREMENT - The development of standards possessing high levels of reliability and validity.

RELIABILITY - Deals with whether a standard is statistically accurate. In other words, is the standard time representative of that needed to accomplish the task.

STAFFING PATTERN - A ratio of the number of personnel required to the number of personnel supported or to the number of units of output.

STANDARD - (1) An established norm for the measure of quantity, weight, extent, value, quality or time. (2) Standard time.

STANDARD COSTING - A system of cost accounting in which costs per unit of production are developed in advance and used as "standards" for an ensuing accounting period. End variations between standard and actual costs are adjusted.

STANDARD DATA - A compilation or list of all the different elements observed on a given class of work with representative time values for each element. These time values may have been determined by use of MTM and/or Time Study techniques. Standard Data makes possible the establishment of time standards on work similar to that from which the data were determined without the necessity of resorting to actual measurement.

STANDARD TIME - The time determined to be required for a qualified worker to accomplish a defined amount of work, normally expressed as manhours per work unit.

STANDARD UNIT COST - Predetermined statements of what costs should be under the most efficient methods of operation. They are usually based on engineered standards.

STATISTICAL STANDARD - see historical standard.

TECHNICAL ESTIMATE - A estimate prepared by breaking the job down into elements and having a technically trained person make a technical estimate of how long each of the job elements should take.

TIME STUDY - A study (by stop watch or motion picture camera) and analysis of an actual job performance followed by a synthesis of the data obtained into a standard time for doing the job.

UNIT COST MEASURES - Costs incurred for resources to produce a specified unit of output.

UNIT COST MEASUREMENT - Relates a work unit to the cost of resources consumed in producing that unit. Performance efficiency (the efficiency measurement) is determined by comparing planned unit cost to actual unit costs.

VALIDITY - Deals with whether a standard reflects the way the task is currently being performed.

WORK CENTER - A group of closely related functions or processes that operates as an independent organizational element. Resource expenditures are uniquely identified to each work center.

WORK COUNT - A count of the total number of work units completed or accomplished during a specified reporting period.

WORK MEASUREMENT - Converts a quantitative statement of workload to a quantitative statement of the manpower to produce that workload. This statement is called a work measurement standard. Performance efficiency (the efficiency measurement) is determined by comparing standard (earned) manhours to actual hours.

WORK MEASUREMENT ACCOUNTING - Collection of data on manhour expenditures and measures of work accomplishments necessary for the operation of a work measurement system.

WORK MEASUREMENT STANDARD - (1) A quantitative statement of units of manpower required to produce a quantified amount of workload. It is developed and formally approved by management. (2) A formally developed expression of the amount of time necessary to accomplish a work unit.

WORK MEASUREMENT SYSTEM - Includes the function of establishing and maintaing work measurement standards plus the use of these standards in one or more management functions. These include budget, manpower, and workload planning and control.

WORK MEASURES - Measures of the work produced by individual work centers (within an organization or component) which can be compared to an objectively derived standard of performance.

WORK UNIT - An item of work selected to express quantitatively the work accomplished.

WORKLOAD - The amount of work imposed upon, or assumed by, a person or organization to be disposed of in a given amount of time. A workload may be greater or lesser than capacity to perform.

# APPENDIX II

## PRODUCTION INCENTIVES AWARD PROGRAM

### 1. Introduction

A government organization has a mission to produce complex reports with a portion of their direct labor personnel. Each report is different and requires the consolidation of many facts. Electronic data processing and complex manual processes are used to compile statistics. A system of engineered standard time data has been developed and is used to determine a standard time for output. The time standard is used to plan and control work activities and also serves as a basis for an incentive awards program.

### 2. Production Incentive Awards

Currently approximately 425 personnel are covered by the incentive awards program. Direct and indirect (non-direct) labor including supervisors are included.

Eligibility for a production award is based on all measured work completed during the entire period of the recommendation. Work under approved standards is given consideration only for the fiscal quarter in which it is performed. In recommending personnel for production awards, the supervisor must be certain that the employee's:

a. Attendance record

b. Cooperativeness on the job

c. Attitude toward the work and associates

d. Error rate is within acceptable limits, and

e. Other factors affecting the organization

are such that they do not offset the value of achieved production.

3. Direct Worker

If a direct worker meets the general requirements, he is eligible to receive a Production Incentive Award in any one of these situations:

a. When the performance of his group attains or exceeds 100 percent and his average performance attains or exceeds 90 percent, he is given a cash award in accordance with Table II.

b. When the performance of his group is 100 percent of a group-standard and he performs at least 16 percent of his time on that standard, he is given a cash award in accordance with Table II.

c. When the performance of his group is under 100 percent, or is unmeasured, and his average performance attains or exceeds 100 percent, he is given a cash award in accordance with Table I.

4. Indirect Worker

An indirect worker is eligible for a Production Incentive Award under the following conditions:

a. He meets the general requirements.

b. He supports a group working under a standard at least 16 percent of the time.

c. The group he supports performs at 100 percent or higher.

If he meets these conditions, the indirect worker is given a cash award in accordance with Table I.

5. Supervisors

A supervisor is considered eligible for participation in Production Incentive Awards when his group's performance attains or exceeds 100 percent and the group has been assigned measured work for 1,000 hours or more. Recommending division chiefs and office heads are responsible for determining which employees are to share in supervisory awards under Table III. Such determinations are based on the distribution of time between supervisory and other activities. For example, the supervisor who spends most of his time on direct work activities would be considered for awards as specified in Tables I or II. On the other hand, an employee engaged primarily in supervisory and administrative tasks would be considered for awards as indicated in Table III.

## 6. Amount of Production Savings

After the amount of the incentive award has been determined from Tables I and II, the savings realized by the organization can be readily estimated by referring to Table IV. The savings shown are based on the difference in costs between the workers' actual performance and performance at 80% of standard.

## 7. Budget Authority

Payment of Production Incentive Awards is authorized by the Agency's Administrative Manual along with other awards under their "Incentive Awards Program." The funding for the Production Incentive Program is solicited as part of a formal budget request as submitted by the work area for the ensuing fiscal year. The request for funds to cover the incentive program is based on previous years' data.

## 8. Executives' Assessment

Executives of this Agency have noted that where work measurement standards were instituted, a 25-30% increase in production occurred. They stated that their work measurement standards are the most profitable investment going for them. Last year $85,000 was paid out for Production Incentive Awards resulting in $2,000,000 in labor savings. They feel strongly that work measurement results in lower unit cost and leads to higher productivity especially when tied to a Production Incentive Award Program.

Table I: For individual direct workers, where group is unmeasured or performance is under 100 percent.

For individual non-direct workers, where group performance is 100 percent or higher.

| Performance % | Percent of Time on Standard [1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 91-100 | 81-90 | 71-80 | 61-70 | 51-60 | 41-50 | 31-40 | 21-30 | 16-20 |
| Under 90..... | - | - | - | - | - | - | - | - | - |
| 90-99 ..... | - | - | - | - | - | - | - | - | - |
| 100-109 ..... | $ 50 | 45 | 40 | 35 | 30 | 25 | 20 | 15 | 10 [2] |
| 110-119 ..... | 70 | 60 | 50 | 40 | 40 | 30 | 25 | 20 | 10 |
| 120-129 ..... | 90 | 80 | 60 | 60 | 50 | 40 | 30 | 25 | 15 |
| 130-139..... | 110 | 100 | 80 | 70 | 60 | 50 | 40 | 30 | 20 |
| 140 & higher. | 130 | 110 | 100 | 90 | 70 | 60 | 45 | 35 | 25 |

[1] Time on standard divided by time available in the quarter.

Table I: Example

A direct worker works 320 hours on standard during the quarter, or (320 + 502) = 63.7 percent time on standard. During that time his performance on standard is 122 percent. Looking at the table we find that the award for 63.7 percent time on standard at 122 percent performance is $60.

[2] Note: The numbers in the table are simulated examples.

Table II: For direct workers where group performance is 100 percent or higher.

| Performance % | Percent of Time on Standard 1/ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 91-100 | 81-90 | 71-80 | 61-70 | 51-60 | 41-50 | 31-40 | 21-30 | 16-20 |
| Under 90...... | - | - | - | - | - | - | - | - | - |
| 90-99 ...... | $ 30 | 25 | 20 | 20 | 15 | 15 | 10 | 10 | 10 |
| 100-109 ..... | 50 | 50 | 45[b] | 40 | 30 | 30 | 25 | 20 | 15 |
| 110-119 ..... | 70 | 65 | 60 | 50 | 40 | 40 | 30 | 25 | 15 |
| 120-129 ..... | 90 | 85 | 75[a] | 65 | 50 | 50 | 40 | 30 | 20 |
| 130-139 ..... | 110 | 105 | 90 | 70 | 60 | 60 | 45 | 35 | 25 |
| 140 & higher . | 130 | 120 | 110 | 90 | 75 | 70 | 55 | 40 | 30 |

1/ Time on standard divided by time available in the quarter.

Table 2. Examples:

a. A direct worker, working 75 percent of the quarter on standards achieves a performance of 125 percent. The group in which he works achieves a group performance of 105 percent. The direct worker receives an award of $75.

b. A direct worker works in a group which has group standard only: the group achieves a performance of 105 percent. The worker works 75 percent of the quarter on standards. The worker receives an award of $45.

NOTE: Numbers in the table are simulated examples

Table III. Supervisor Incentive Award Table for Intangible Savings
(Award to be divided among the supervisors of earning group)

| Hours on Measured Work | Performance | | | | |
|---|---|---|---|---|---|
| | 100-109 | 110-119 | 120-129 | 130-139 | 140 & Higher |
| 1,000 - 1,500 | 25 | 35 | 45 | 55 | 65 |
| 1,501 - 2,000 | 35 | 45 | 60 | 70 | 80 |
| 2,001 - 2,500 | 45 | 50 | 80 | 100 | 110 |
| 2,501 - 3,000 | 55 | 60 | 100 | 120 | 140 |
| 3,001 - 3,500 | 65 | 80 | 110 | 140 | 170 |
| 3,501 - 4,000 | 75 | 100 | 130 | 160 | 190 |
| 4,001 - 4,500 | 85 | 110 | 150 | 180 | 220 |
| 4,501 - 5,000 | 95 | 120 | 170 | 210 | 250 |
| 5,001 - 5,500 | 100 | 140 | 190 | 220 | |
| 5,501 - 6,000 | 115 | 160 | 210 | | |
| 6,001 - 6,500 | 120 | 170 | | | 610 |
| 6,501 - 7,000 | 130 | | | | 640 |
| 7,001 - 7,500 | 140 | | | 560 | 670 |
| 7,501 - 8,000 | | | 480 | 580 | 690 |
| 8,001 - 8,500 | | 390 | 500 | 605 | 720 |
| 8,501 - 9,000 | | 405 | 520 | 635 | 750 |
| 9,001 - 9,500 | | 410 | 530 | 650 | 770 |
| 9,501 - 10,00 | | 430 | 550 | 670 | 805 |
| 10,001 - 1 | 305 | 440 | 570 | 700 | 820 |
| 10,501 | 315 | | | | |
| 11 16,500 | 325 | 460 | 590 | 710 | 850 |
| 1 - 17,000 | 335 | 470 | 610 | 720 | 880 |
| ,001 - 17,500 | 345 | 490 | 630 | 750 | 910 |
| 17,501 - 18,000 | 355 | 500 | 640 | 790 | 930 |
| 18,001 - 18,500 | 365 | 515 | 660 | 810 | 960 |
| 18,501 - 19,000 | 375 | 530 | 670 | 820 | 980 |
| 19,001 - 19,500 | 385 | 540 | 700 | 850 | 1010 |
| 19,501 - 20,000 | 400 | 560 | 720 | 860 | 1040 |

Table 3 example:
A supervisor of a unit consisting of four employees has 1,250 hours worked on standard during a quarter. The group performance on standard for this unit is 115 percent. Table 3 indicates for 1,250 hours at 115 percent, a supervisory award of $35.
NOTE: Numbers in Table are simulated examples.

## Table IV
## Table for Determining Average Savings from Award Amounts

| Incentive Award | | Savings $ |
|---|---|---|
| Table I | Table II | |
| 15 | 15-20 | 200 |
| 20 | 25 | 330 |
| 25 | 30 | 440 |
| 30 | 35 | 540 |
| 35 | 40 | 630 |
| 40 | 45 | 742 |
| 80 | 85 | 1550 |
| 85 | 90 | 1600 |
| 90 | 95 | 1800 |
| 95 | 100 | 1850 |
| 100 | 105 | - |
| 105 | 110 | 2000 |
| 110 | 115 | 2100 |
| 115 | 120 | 2200 |
| 120 | 125 | 2400 |
| 135 | 140 | 2600 |

**NOTE:** Numbers in the Table are simulated examples.

# APPENDIX III

## WORK MEASUREMENT TECHNIQUES

The following are the principal techniques by which Work Measurement Standards are developed:

- Technical Estimates
- Historical Estimates (Statistical)
- Staffing Pattern
- Work Sampling
- Time Study
- Predetermined Time Systems
- Standard Data

Engineered standards are developed using time study, work sampling, standard data, and predetermined time systems. Engineered standards are the "should take" time to perform a task or operation. They should be developed by specially trained analysts and include documentation of the:

- Method or procedure used when the standard was developed.
- Observed or synthesized time values used in determining the final standard time.
- Computations used to establish statistical reliability.
- Rating or leveling observed during performance.
- Allowances used in computation of standard.
- Computations made in developing standard.

Non-engineered standards are developed using any of the techniques listed. Historical estimates (statistical) and technical estimates are most commonly used.

A. Work Measurement Techniques and Their Application

| Techniques | Types of Operations | Examples of Operations |
|---|---|---|
| Technical Estimate | a. Highly technical or irregular work | Maintenance, rebuild repair of complex items |
| | b. Scheduling & controlling projects for priority, status, evaluation and costing | Technical, egnineering, and research projects. |
| Historical Estimates (Statistical) | a. Irregular work where a work unit may be determined | Administrative, non-direct labor, warehousing |
| Staffing Pattern | a. Highly irregular work for which no work unit may be determined | Administrative, support activities |
| Work Sampling | a. Irregular work where a work unit is highly correlated to work input | Clerical, rebuild repair, warehousing, facility maintenance, non-direct labor |
| | b. Development of management information. (NOTE: not used to establish work measurement standards) | Determination of delays, utilization of people and equipment, work distribution, feasibility studies, performance checks. |
| Direct Time Study | a. Repetitive, short cycle work performed at essentially one work station | Parts assembly, machining, packaging, typing, filing, editing, packing |
| | b. Irregular, medium to long cycle work, frequently performed by moving about several work stations | Janitorial, clerical, rebuild, repair, warehousing |

| Techniques | Types of Operations | Examples of Operations |
|---|---|---|
| Predetermined Time Standards or Basic Standard Data | a. Repetitive short cycle work where volume is high | Assembly, machining, packaging, packing, shipping, stock picking, editing |
| | b. Check as to consistency of direct time study standards | Assembly, machining machine operations |
| Standard Data | a. Repetitive short and medium cycle work where volume is high | Assembly, machining, packaging, typing, filing, editing |
| | b. Repetitive work where volume is low, or long irregular cycle work where work volume is high | Assembly, machining, packaging. rebuild, repair, maintenance, clerical, warehousing |

B. Work Measurement Technique Descriptions

## TECHNICAL ESTIMATES

Description - breaking the job down into elements and having a technically trained person make a technical estimate of how long each of the job elements should take.

### What Is Required?

A person technically qualified to recognize the various phases of the work to be accomplished.

### What Must Be Done?

Job broken down into phases and time estimated for each phase. Experience and/or past performance data will form the basis for the time estimates.

### How Long Will It Take?

From minutes to days depending upon the complexity of the job.

### What Are The Characteristics?

This type of standard is based upon the personal judgment of the person making the estimate. His technical estimate of how long it should take to do the job may vary greatly from how long it actually takes to do the job. Thus, it is difficult to accurately assign a cause to deviations from standard.

### Advantages

1. May be only technique available to establish time limits on certain types of jobs (technical projects, research projects, etc. ).

2. Relatively cheap (in relationship to time).

### Disadvantages

1. Time to do the job is an estimate; thus, worker's actual time may show wide variance (poor control device).

2. No way of knowing what methods are used to do the job.

# HISTORICAL ESTIMATES (STATISTICAL)

Description - data obtained from records of past performance relating labor time expenditures with some measure of the amount of work produced. (The data may be analyzed by statistical means.)

## What Is Required?

Data on past performance of individual jobs, producing like product, expressed in;

1. Manhours expended, and
2. Units produced

## What Must Be Done?

A Relationship between units of product and manhours expended must be found and statistically validated.

## How Long Will It Take?

From days to weeks to months, depending upon the amount of data required or available.

## What Are The Characteristics?

This type of standard is based upon the assumption that what has happened in the past is good practice and that what will happen in the future will not alter the relationship between units of product and manhours expended. As a result, it is difficult to identify a significant deviation from standard and more difficult to accurately assign a cause.

## Advantages

1. Sometimes, this is the only technique available for extensive coverage in a hurry.

## Disadvantages

1. Accepts past performance as satisfactory (poor control device).

2. No way of knowing if past and present methods are the same.

## STAFFING PATTERN

Description - a ratio of the number of personnel required to the number of personnel supported or to the number of units of output.

NOTE: A staffing ratio is not always classified as a work measurement standard. It is considered to be a work measurement standard only when it is related to a measure of output. If it is merely an expression of a percent of direct labor or budget dollar or one clerk per ten professionals, it is not considered to be a work measurement standard because there is no unit of output. It may be developed using an engineered or non-engineered technique.

### What Is Required?

A person with a semi-broad management background technically qualified to recognize the various phases of the work to be accomplished. Person must have appreciation of management process so as to be able to determine various relationships and effects of support and supported functions.

### What Must Be Done?

Job broken down into major functional areas and identified as support or supported functions. Relationships, direct and non-direct, among areas must be identified. Comparisons should be made to similar functional areas and relationships which seem from judgment to be working in a satisfactory manner.

### How Long Will It Take?

From minutes to days, depending upon the complexity of the job.

### What Are The Characteristics?

This type of standard is based upon the personal background and judgment of the person(s) making the estimate. His estimate of situation depends greatly upon his ability to infer, draw analogies and conclusions based upon other existing similar situations. Difficult to determine cause of deviations from anticipated. Cannot tell whether poor performance or poor conditions or incorrect original determination.

### Advantages

1. May be only technique available to establish manpower requirements.
2. Relatively quick and cheap.

### Disadvantages

1. Accepts past relationship as being sound.
2. No real way of knowing validity.

## WORK SAMPLING

Description - a sampling type study wherein an observer at random intervals observes and determines categories of productive and non-productive effort of the activity being observed.

### What Is Required?

An opportunity for an observer to note which categories of work or non-work the operator or operators are engaged in at the random times he makes his observations.

### What Must Be Done?

The job must be broken down into categories of work and non-work and these categories described; at random intervals the activity must be observed and the observations classified into the proper categories with sufficient observations taken to get a reliable sample; the performance of the operator or operators is compared to the concept of normal, and allowances are made for personal and unavoidable delays. During the period the job is being observed, a production count must be obtained (unit of measure) and the total time of the study must be recorded. With the above information, the allowed time for the various units of production can be determined.

### How Long Will It Take?

From one week to several months, based upon the number of different types of work and non-work being observed (complexity of the activities being observed).

### What Are The Characteristics?

This type of standard will give substantially the same results as time study standards where there is a clear distinction between working time and idle time. In establishing a work sampling standard, the observers must be alert for slight methods changes on the part of the operators. This type of study does not allow as fine a breakdown of activities and delays as time study. The job content and the standard time are specified in general terms. Because job conditions (such as method, quality, and operator performance) are standardized, it is relatively easy to identify a deviation from standard and to assign a cause for the deviation.

Advantages

1. Can be used to measure activities which are impractical or costly to measure by other means.

2. Requires less time (can study several operators or machines at once).

3. Generally less costly than time study.

Disadvantages

1. Not generally economical for studying a single operator.

2. Methods Control may not be as precise as Time Study.

3. Operator may change work pattern without being observed.

# TIME STUDY

Description - a study (by stopwatch or motion picture camera) and analysis of an actual job performance followed by a synthesis of the data obtained into a standard time for doing the job.

## What Is Required?

An opportunity for a trained observer to time an individual job actually being performed by a definite method (preferably the improved and standardized method).

## What Must Be Done?

The job method must be completely described, the cycle or elemental times must be obtained by use of stopwatch or motion picture camera, the performance of the operator or operators compared to concept of normal, and allowances made for personal and unavoidable delays. With the above information, the allowed time for the various units of production can be determined.

## How Long Will It Take?

From 2 to 3 hours for simple, short-cycle jobs to days or weeks for complex, long-cycle jobs.

## What Are The Characteristics?

This type of standard is generally considered a valid and reliable basis for establishing time standards. The job content and the standard time are specifically defined. Because the method, quality, working conditions, and operator performance are standardized (highly), it is easy to identify a deviation from standard and to assign a cause for the deviation.

## Advantages

1. Detailed methods description (good for control purposes).
2. Relatively accurate work measurement technique.
3. Obtain actual time values for jobs being observed.

## Disadvantages

1. Each job must be observed and the performance pace rated.
2. Not economically applicable to all jobs.

# PREDETERMINED TIME SYSTEMS

Description - proprietary time systems using time data at the basic motion that is synthesized into a standard time for a job. Includes Methods Time Measurement (MTM) and General Purpose Data (GPD).

## What Is Required?

Dimensioned sketch of workplace layout and product along with information about other features of the job. Requires that the person applying the predetermined time system be completely familiar with the system and able to identify the basic motions pertinent to the job being studied.

## What Must Be Done?

The method for performing the job must first be described in terms of elements, then the elements broken down into basic motions pertinent to the particular predetermined time system, time values for the various basic motions chosen from tables and allowances made for personal and unavoidable delays. With the above information, the allowed time for the various units of production can be determined.

## How Long Will It Take?

From 2 to 3 hours for simple, short-cycle jobs to days for complex, long-cycle jobs.

## What Are The Characteristics?

This type of standard is as valid and reliable as time study for setting time standards. Where predetermined time system time values are used to set standards on all the activities, the various standard times will be more consistent for all the standards. Good work measurement technique to use to establish standard time on manual jobs before the jobs are begun. Can be used for control purposes where all or most of the activities are covered by similar type standards.

## Advantages

1. More consistency between time values.
2. Eliminates performance rating by analyst.
3. Can be used to compare methods (provided there is no machine time).

4. Can set standard time for job prior to performing the job.

5. Provides a sound basis for engineered standard data.

Disadvantages

1. Judgment is required to identify basic motions.

2. Not applicable to process controlled, machine controlled, and long or irregular cycle jobs.

3. Detailed type of analysis - costly.

## STANDARD DATA

Description - time data at the element level (may have been obtained from previous time studies) which is synthesized into a standard time for a job.

### What Is Required?

Time values in the form of tables, curves, charts or formulae for units of work (elements) small enough to permit determining the step-by-step time required by any method involving these job elements. A person technically qualified to break the job down into its various elements and able to apply the correct time values to those job steps.

### What Must Be Done?

- To develop standard data

The data must be obtained by either time study, use of predetermined time system, work sampling, or possible historical data. Preferably the elemental time values should be obtained by observing the element being performed in several different jobs. The data may be arranged in tables, curves, nomographs, alignment charts, multi-variable charts, and formulae for rapid and economical use.

- To establish work measurement standard

The method for performing the job must be broken down into elements, time values for the various elements selected from tables, curves, charts, or formulae, and allowances made for personal and unavoidable delays. With the above information, the allowed time for the various units of output can be determined.

### How Long Will It Take?

- To develop standard data

From weeks to months depending upon the amount of data necessary to set up the elemental standard data system.

- To establish work measurement standards

Minutes to hours to determine time values for jobs depending upon the complexity of the job.

## What Are The Characteristics?

This technique is generally considered to be a valid and reliable basis for establishing standards. However, when all activities are covered by elemental standard data, the various standard times will be more consistent for all the standards. A very good work measurement technique to use to establish standard time on jobs before the jobs are begun. Because job conditions are standardized, it is easy to identify a deviation from standard and to assign a cause for the deviation.

## Advantages

1. More consistency between time values.
2. Can be used to compare methods.
3. Can set standard time for job prior to performing the job.
4. Inexpensive method to establish standard, once standard data has been developed.

## Disadvantages

1. Requires time to build up standard data.
2. Costly to build up standard data.

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# APPENDIX IV

## INTEGRATED RESOURCES MANAGEMENT SYSTEM

A few years ago, a newly created Agency faced with a requirement to develop a work measurement program, started by concentrating their efforts on standards coverage without an overall systems approach. In less than one year, management realized the shortcomings of this "shotgun" approach and dropped it. Management further realized the importance of work measurement in the budgeting and manpower planning process and that work measurement was only one of many management tools that could be used to manage resources. Thus, a systems approach was adopted in developing their resources management system.

Accordingly, a headquarters task team surveyed existing resource and work measurement systems of other Governmental Agencies that were readily adaptable for their purposes. The following is a synopsis of the Integrated Resources Management (IRM) system this Agency developed.

The component elements of the IRM system may be illustrated graphically in the following manner:

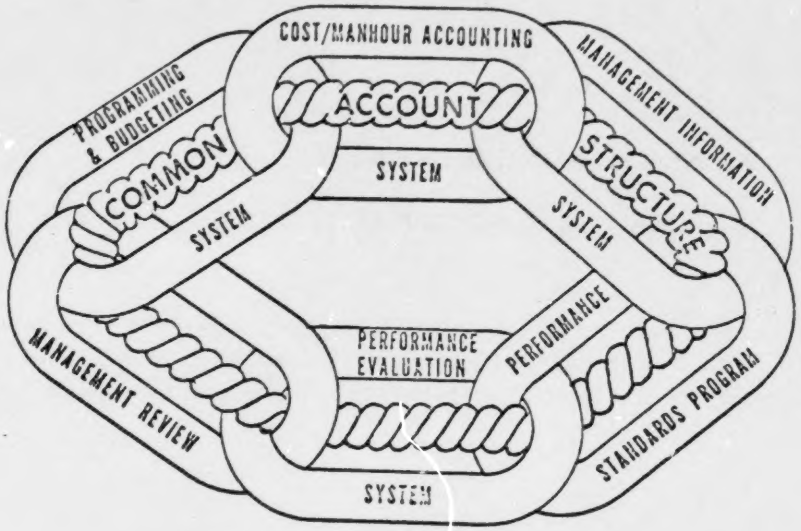

COST/MANHOUR ACCOUNTING
ACCOUNT
SYSTEM
MANAGEMENT INFORMATION
STRUCTURE
SYSTEM
PROGRAMMING & BUDGETING
COMMON
SYSTEM
PERFORMANCE
PERFORMANCE EVALUATION
STANDARDS PROGRAM
MANAGEMENT REVIEW
SYSTEM

FIGURE 1. INTEGRATED RESOURCES MANAGEMENT SYSTEM

IRM is a closed loop system in which the component elements are integrated and complement each other.

Fundamental to the entire system is the INTEGRATED COMMON ACCOUNT STRUCTURE which supports all component elements. This common account structure is shown below in abbreviated format.

## SUMMARY LEVEL

## COMMON ACCOUNT STRUCTURE

| Program Area | Program Description |
|---|---|
| 100. | PROCUREMENT ACTIVITIES |
| 200. | MATERIAL MANAGEMENT |
| 300. | STORAGE ACTIVITIES |
| . | |
| . | |
| . | |
| . | |
| 800. | GENERAL ADMINISTRATION |
| 900. | COMMAND & SUPPORT ACTIVITIES |

220. STOCK CONTROL
221.01 REQUISITION PROCESSING

Each program area is the responsibility of a specific staff element of the Agency Headquarters. An example of Program 200 (P200.00), Material Management account is illustrated in Figure 2 below.

## INTEGRATED COMMON ACCOUNT STRUCTURE

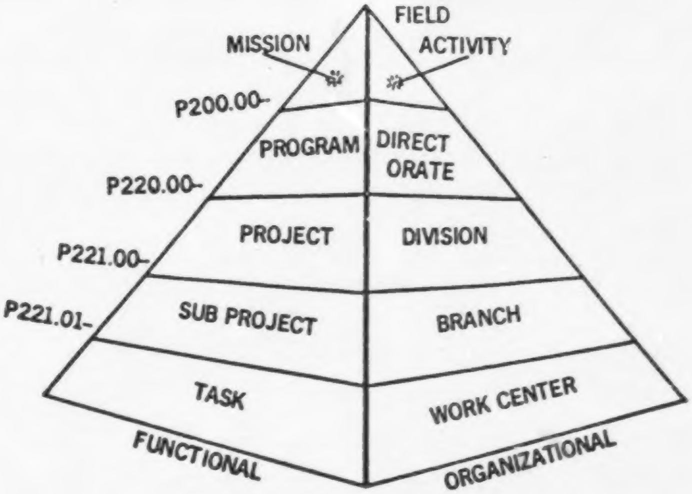

FIELD
ACTIVITY
MISSION
P200.00-
PROGRAM
DIRECT
ORATE
P220.00-
PROJECT
DIVISION
P221.00-
P221.01-
SUB PROJECT
BRANCH
TASK
WORK CENTER
FUNCTIONAL
ORGANIZATIONAL

FIGURE 2.

The common account structure concept depicted by the chart permits aggregation and visibility of data, functionally and organizationally, from the work center level at the field installation through headquarters.

Starting on the right side of the pyramid, data is structured organizationally to branch, division, directorate, command and total headquarter levels. On the left side of the chart, data is structured functionally to subproject, project, program and total mission levels. The structure applies to COST ACCOUNTING, OUTPUT MEASURES, PERFORMANCE STANDARDS, PERFORMANCE EVALUATION, MANAGEMENT REVIEW, AND PROGRAMMING AND BUDGETING.

# COST MANHOUR ACCOUNTING SYSTEM

Referring back to Figure 1, the cost/manhour accounting system provides for the collection of manhour and cost data reflecting the application and consumption of resources. Dollar and workload data for resources management at both the local field activity and at headquarters is accumulated, processed, and displayed using EDP equipment. Inputs consist of data on manhour cost accounts, personnel information, work units, codes and standards daily labor exception input for any employee not working on his assigned cost account code, plus workload accomplished.

The system cycles daily and produces the following outputs:

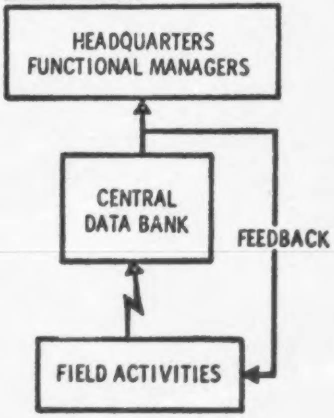
> Daily/Weekly - Efficiency listings show efficiencies, manhours used and workload accomplished. Data is displayed functionally within each organizational level.
>
> Biweekly - The payroll is produced. All manhour data are reconciled to the payroll.
>
> Monthly - Efficiency listings, both organizationally and functionally, at the levels shown. Also, from the same base of data at the field activity, information on personnel, manhours, cost and production is sent to the headquarters data bank.

Next on the loop is the Management Information System which features a central data bank to provide all levels of management with a wide range of timely information on operations. As indicated in the schematic below, information on labor expenditure, costs, production, etc. flows from the field activities to the central data bank. Here it is processed with outputs flowing up to the higher headquarters as well as back to the local activity for management decisions and actions.

**BASIC CONCEPTS**

1. SINGLE INPUT OF A DATA ELEMENT
2. CENTRAL DATA BANK
3. AUTOMATED SUBMISSION/PROCESSING

DATA FLOW



## PERFORMANCE STANDARDS PROGRAM

The Performance Standards Program interfaces with the IRM system by developing standards for determining manpower requirements and evaluating performance efficiency.

Shown below is the proper sequential approach for establishing an effective work measurement program.

- Improve Methods
- Select Appropriate Techniques
- Develop Standards
    - Attainable
    - Consistent
    - Total Coverage
    - Current
- Apply Standards
    - Budget Formulation
    - Resource Allocation Decisions
    - Work Planning and Control
    - Performance Review

At the lower organizational levels (work center level), work measurement efforts are systematically directed to the analysis and improvement of methods, procedures, and systems leading to better operations. Appropriate standard setting techniques are determined and standards are developed to reflect the "should take time" to accomplish a work unit under these improved methods and procedures. These standards are then used at all levels of management to formulate the budget, to determine the proper allocation of resources, to plan and control work, and to analyze and review actual performance.

An important aspect of the work measurement program is the summarization or aggregation of standard at the lowest organizational levels to the highest organizational levels. Below is an illustration of how detailed standards are aggregated into summary standards.

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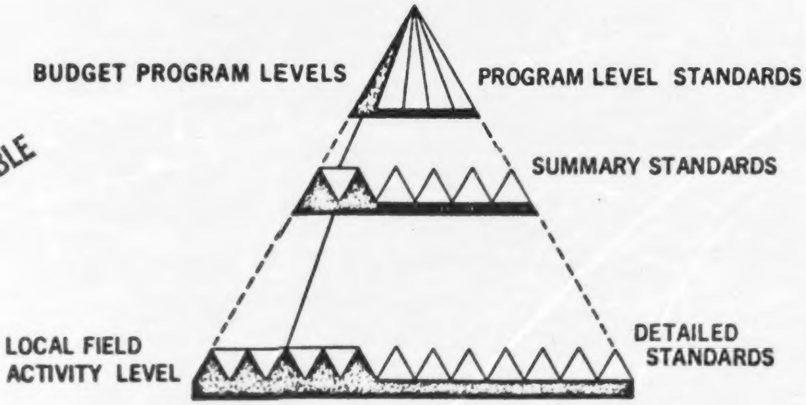


Hierarchy of Standards

The detailed standards, based on earned hours, are structured into summary standards usually at the project or subproject level. Summary standards are then aggregated into program standards for headquarters level use in budget formulation and resourcing field level activities.

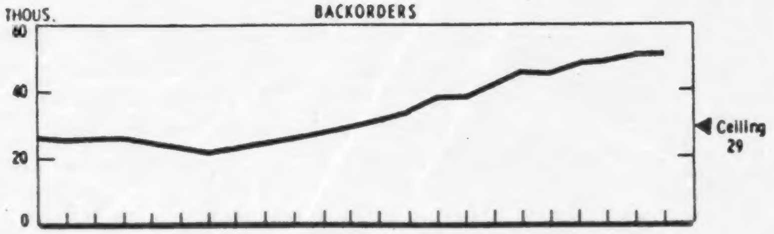
## PERFORMANCE EVALUATION REPORTING SYSTEM

The Performance Evaluation Reporting System (PERS) link in Figure 1 is a computerized analytical reporting system that utilizes information from the MIS central data bank. It acts as a barometer for determining the changes in workload/resource relationships. It is the primary management tool for appraising resource utilization.

## MANAGEMENT REVIEW

The Management Review phase of the IRM system provides for recurring performance briefings to top management and is built on the premise that top management must be kept abreast of significant actions within the organization. Monthly reviews are presented showing planned vs. actual program efficiency status, program effectiveness, and current trends in workload, resource utilization, and productivity.

A few examples of mission effectiveness reviews are shown below.



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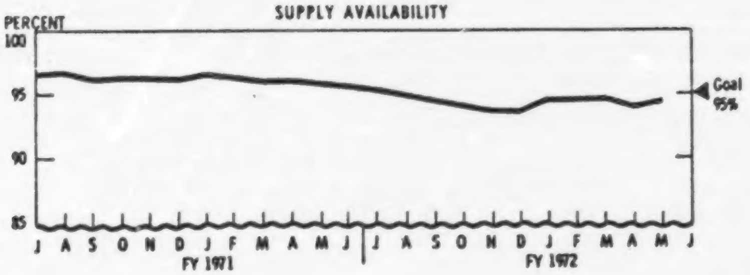
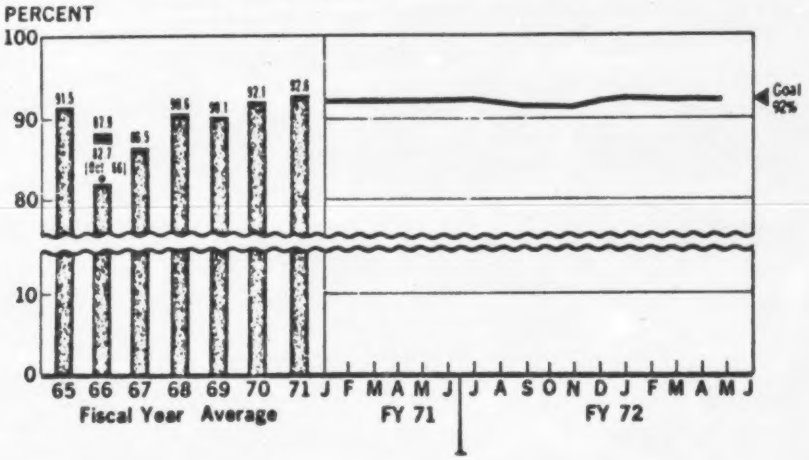


## STOCK AVAILABILITY



## PROGRAMMING AND BUDGETING SYSTEM

The program/budget system, which completes our closed loop, utilizes workload-based performance budgeting techniques. Quantified workloads are expressed in terms of mission-oriented output measures and translated into manpower and funding requirements through the application of performance standards and pricing factors. It functions normally for the determination and justification of resources to higher levels and internal allocations of resources for current operations.

A summary of the major activities in the system are listed as follows:

- Forecast workload (Gross Mission Oriented Output Units).
- Establish performance rates.
- Determine productive manpower requirements.
- Adjust productive manpower requirements (+ leave; - overtime; - military).
- Apply pricing factors (average salary; non-personnel; overtime).
- Develop work-based performance budget.
- Distribute resources (order of mission priority).
- Review budget consumption (continuing; redistribution/reorder of priorities).

# APPENDIX V

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